IN THE ISSUE OF JANUARY 1930

COVER DESIGN
By Harry Jewett
FRONTISPIECE, WINGED MYSTERIES..... 10
By Emma Wilson Emery
THE PUBLISHER'S QUILL..... 11
AIRCRAFT OF THE NEAR FUTURE..... 13
By General William Mitchell
ALL THE WORLD'S A MARKET PLACE..... 15
By Z. M. Allison
THREE OF THE LATEST..... 17
A LETTER AND A PREDICTION FROM LOUIS BLERIOT..... 18
IN THE FLOODLIGHT..... 20
DISTRIBUTION PROBLEMS IN THE AIRPLANE INDUSTRY..... 21
MODERN AIRPORT CONSTRUCTION..... 22
By Francis Keally
SOME NEW EQUIPMENT..... 24
ONE DAY FLYING COURSE..... 25
SAILBOATS OF THE AIR..... 26
By Walter E. Burton
TO REACH THE AIRPORT..... 28
FAIRWAYS FROM THE SKYWAYS..... 29
By G. H. Dacy
EXAMINING NAVAL FLYERS..... 31
By Cdr. Robert G. Davis
FOUR INTERIORS..... 33
AERONAUTIC LAW..... 34
By Bailey Samelow
AERODYNAMICS..... 35
By Prof. Alexander Klemin
AERIAL NAVIGATION..... 37
By Cdr. Douglas G. Jeffrey, R.N.
MONTHLY FINANCIAL REVIEW..... 39
By J. Allen Grover
THEY TELL US..... 40
THE "PANCAKE" RADIO RECEIVER..... 41
By S. R. Winters
A BIOGRAPHICAL SKETCH—A. A. PRIESTER.... 42
By Helen K. Schunck
BRIEF NOTES FOR THE MONTH..... 43
THREE MODELS..... 48
DIRECTORY..... 56
WOMEN'S ACTIVITIES..... 70
By Lady Mary Heath
THE SWELLING WING..... 83
BOOKS OF THE MONTH..... 87
MODEL DEPARTMENT: BUILDING THE "C" EAGLE..... 93
By Bertram Pond
A FOOLPROOF AIRPLANE..... 97
FUTURE EVENTS..... 98
INDEX TO ADVERTISERS..... 98

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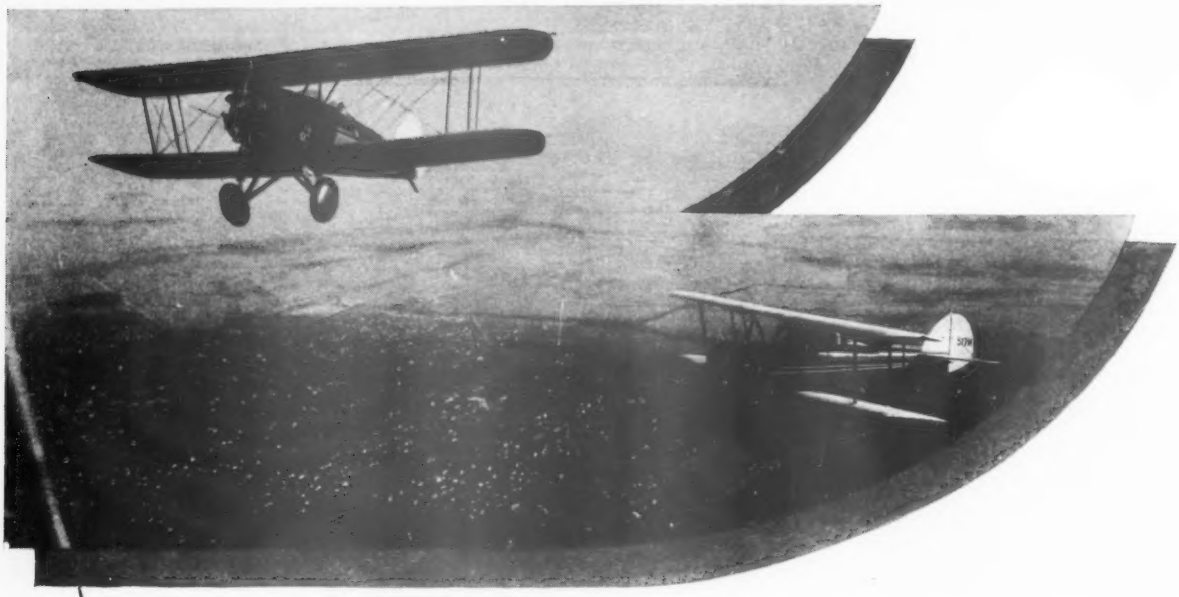


WINGED MYSTERIES

It used to be that I looked down
And watched a violet grow.
I studied mystery concealed
Within a purple row—
Some hidden Truths of God I found
Revealed to make me know.

But now, against a dusty field
My shadow often lies
And, looking upward, I behold
A mystery that flies.

Some searchers could not find the Truth
Within a purple row;
And so God fashioned them a plane
And helped them make it go.

Emma Wilson Emery

The photograph shows an accidental double exposure of a Waco in flight.

"Simple duty hath no place for fear"
Whittier

From THE PUBLISHER'S QUILL

Aeronautics ADVOCATES

A unified air service with adequate appropriations.

A great National Air Academy.

Repeal of tax on gasoline sold on air fields.

Unified State and National laws governing aircraft.

DEVELOPING A CREAM MARKET

THE development of new markets for the sale of airplanes offers itself as one of the quickest ways out of the present slack period in which the aviation industry finds itself. The airplane manufacturer, in turn followed by the various allied manufacturers, is quite able to produce a satisfactory product, and in sufficient quantities, but is retarded by a limited opportunity to sell his product.

Many solutions have been offered: Foreign markets should be developed. More planes should be sold to present plane owners. Business houses should be sold on the idea of purchasing planes or fleets of planes for business use. Private ownership should be encouraged.

It can safely be said that most airplanes are sold to those who know how to fly; it follows that the more people of means who take up flying, the more opportunities there will be for selling airplanes. There are naturally many planes sold to non-flyers, but the market of individuals and firms who are in a position temperamentally and financially to spend thousands of dollars to buy a plane, and in addition employ a private pilot at $4,000 to $6,000 per year, is indeed limited.

It has encouraged many aviation executives to know that about 26,000 student permits have been issued this year by the Department of Commerce. We do not feel particularly encouraged by this fact. In 1928 there were over 11,000 student permits issued, yet no great period of prosperity fell upon the industry.

In attempting to gauge the value of these students in terms of future markets, it is essential that both quantity and quality be considered. The fact that there are 50% more flying students in 1928 than in 1929 *might* indicate that the possibilities of selling airplanes to them tended to increase proportionately, but it is by no means a certainty. The type of student will be the important factor. In our opinion, for example, 100 "Y" men at Yale would provide a greater opportunity for selling airplanes than 1,100 men selected at random.

This then brings us to the question of what type of market are we developing at the many flying schools now growing up throughout the country. An official of one of the large flying schools in the Mid-West confidentially informed the writer that approximately 90% of their enrollment was composed of young men who wanted to get jobs in aviation—prospective jobholders not necessarily prospective plane-owners. In the opinion of our informant, he did not believe that the average student was in a financial position to consider the purchase of a plane after having paid for his course, and further added he "did not recall off-hand any student who had purchased a plane that year." Perhaps some schools can show on the average a much better class of student, perhaps some will show a poorer, but on the whole we do not believe that a general survey would indicate results much different from the above instance.

We do not discount the tremendous value of this type of student for the advancement of aviation, but we would not place too much faith in him as a market.

Where, then, shall we develop our flying students? The American colleges offer an excellent source. The cream private-market as well as many of the future business executives and sportsmen will be found there.

Many of the colleges and universities today are offering courses in aeronautics, giving degrees in aeronautical engineering, in some cases Master and Doctor degrees. Most of the schools, however, limit their training to ground courses, classroom theory and laboratory work. Only a few offer actual flight training, and do so only in an indirect manner.

In our opinion, the aviation industry would be given a tremendous assist if every important university and college offered its students not only a ground course, but also an actual flight training course leading to a Department of Commerce license. *Certainly every State university should receive a sufficient appropriation from the State Capitol to offer its students such an opportunity.* Privately endowed schools could well solicit similar assistance from their airminded patrons and perhaps some cooperation from a local flying school or aircraft company.

In this manner, the individual school would benefit, the air value of the community or State would be enhanced, and the entire country would receive the benefits of a yearly turnout of high quality, generally well-to-do, educated pilots, and incidentally the type of pilots who will sooner or later provide an ideal market for selling airplanes.

The actual flight training could be given in many ways. It could come by affording the R. O. T. C. student the opportunity to take his training in the summer at an army flying field as is done at the University of Michigan. It could be handled as is done at Worcester Polytechnic Institute. The Institute operates two ground school classes for the Curtiss Flying Service of that city and Curtiss Flying Service in exchange gives the college students their practical work at the airport. A simple tie-up for flight training could be made with a local flying school as is done at the University of Pittsburgh with the Penn School of Aviation or the University of Florida

[*Continued on page 90*]

AIRCRAFT OF THE

by General Wm. Mitchell

SPEED is the dominating characteristic of air transport. Therefore aircraft must be devised to give maximum speed, combined with safety and economy of operation. The problem must be studied in accordance with the conditions that confront us. While these divide themselves into a great many different elements, I shall only take up some of the major problems because from these the small ones may be figured out.

We have the problem of air transport across our continent, from New York to San Francisco, a distance of about 2,400 miles. Over this terrain we find varying conditions of altitudes to be crossed, varying temperatures, fogs, storms, the heat of Summer and the cold of Winter. Our aircraft must be able to fly through storms of the worst kind, to land in fogs, to maintain their direction both night and day in all kinds of weather, and with all to give maximum safety and comfort to passengers and crew. The aircraft being used at present are very primitive in design, motive power, safety devices and means of navigation. By the last, I mean pilotage, that is, taking the airplane from place to place in safety. Navigation in the sense that it is used on seacraft, that is, taking the altitude of fixed stars and plotting the position by latitude and longitude, is practically a thing of the past. It is rapidly giving way to electrical navigation in which the position of the airplane is fixed by radio impulses sent or received, both from the plane itself and from ground stations.

Most important of all in an airplane is the motive power, or means of keeping it in the air. The power plant must run continually so as to give sustentation in flight. If the engines fail, an airplane, being heavier than air, has to come down to earth.

Engines may be so arranged in airplanes that they can be worked on in the air in case of trouble. We take a single engine airplane off the ground, say, at 2,000 revolutions of the engine, which is full power. When it assumes a horizontal course in the air, we throttle the engine down to 1,500 revolutions. This is done for three reasons, first to ease up on the engine and not subject it to the increased wear and tear which results from running at the highest speed; second, to provide a reserve of power in case we get into trouble; and third, to cut down the gasoline consumption which jumps up tremendously as the maximum power is reached. There is a stage where the engine delivers its maximum power for the fuel consumed. If engines could always be run at this speed, they would give a much better account of themselves.

Suppose that instead of one engine, we had four, which were always run at a constant speed that gave maximum efficiency from a standpoint of wear and tear and fuel. We would rise with four engines running and when we got into the line of flight, cut out one engine and have three-fourths of our power, just as we did with one engine when we throttled it down one-fourth. (This is not exact but is used as an illustration.) The extra engine would be available to cut in, in case one of the others failed, or if we needed reserve power for any reason.

The multi-engined airplanes now being used in this country have a separate propeller for each engine. Most of the propellers are very small, mere toothpicks, consequently very inefficient, because they cannot reach out and grab the good air which is unaffected by the disturbance set up close to the airplane. Also the large surfaces behind them, such as engines, fuselage and wings, cut down their efficiency again. If one propeller is set behind another, the rear propeller loses a great deal of its power on account of the slipstream from the front one; also, the faster a propeller moves, generally, the less efficient it is. Most propellers used today move from 1,200 to 2,500 revolutions when they should move somewhere around 800.

For the greatest efficiency we should place our engines in an engine room, as is done in boats, driving them through gearing on to a single propeller, large enough to get away from most of the disturbances caused by the body of the

A popular English type of development is illustrated by this Vickers Vulture Amphibian.

NEAR FUTURE.....

This is the last of a series of six articles by General Mitchell in which he draws from his wide experience to forecast the trend of aircraft development.

plane. Some years ago, I had gears of this kind made and tested which proved completely satisfactory. I also had a propeller designed, 27 feet in diameter, which would have answered our requirements. With this sort of power plant, we could get away from the present system of hanging small engines here and there about an airplane, where they have to operate under a great handicap, both as to aerodynamic efficiency and from a standpoint of safety. If the orbit in which the propeller rotates is opposite any part of the fuselage or controls of a plane, and the propeller breaks, the airplane will be cut in two and the passengers killed. Any number of engines, four, six, eight or ten, could be used through gears. The weight of the gearing would not amount to over one-quarter pound per horsepower, and the loss in transmission would be very small.

I prefer a liquid cooled engine, over the air-cooled type, with the cylinders in line, in V or radial. Since the use of non-boiling, non-freezing and non-evaporating compounds for cooling engines has become general, the old problem of water cooling is much simplified. The expansion and contraction of these liquids is less than that of water. Radiators can be made a part of the wings or areofoil and the engines installed where most convenient for the transmission of their power to the propeller, and their accessibility while in the air. It is entirely possible to change an engine while in the air, just as it is possible to refuel an airplane.

For commercial work, a single thick winged ship answers our present needs better than any other kind. Instead of carrying passengers and freight in the fuselage as is at present done, they should be carried in the wings, and the fuselage constructed essentially as a support for controls and the necessary equipment to make a ship fly well. The propeller could either be a tractor, that is, one in front, or a pusher, at the back; or a plane could have both, only one being used at a time, the other held in reserve and folded into the wing.

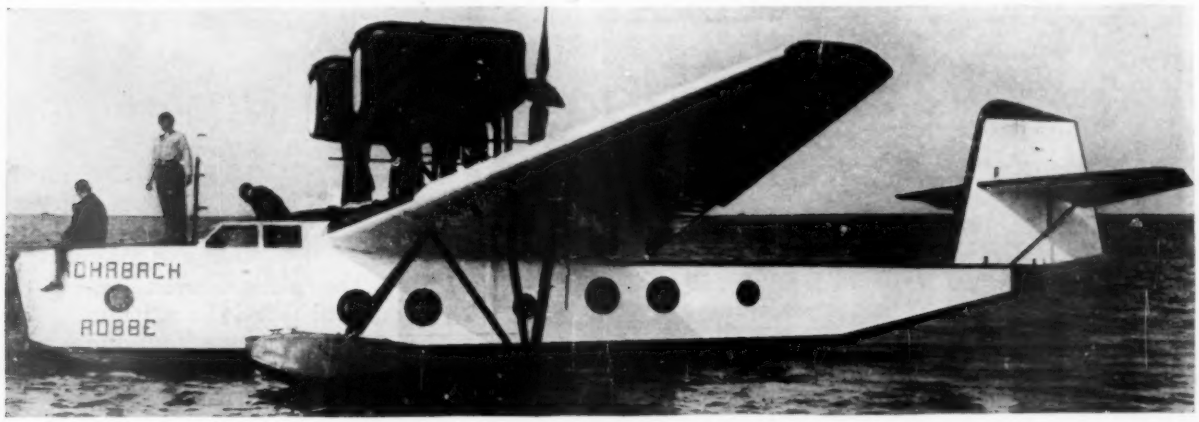
Whatever the nature of our landing gear, it should be folded up into the airplane when in flight, to eliminate the resistance it offers to the air stream. Airplanes with retractable landing gear show an increase in speed of from ten to twenty per cent when the wheels are folded up, as compared to when they are extended. If we use wheels, they should be ten or twelve feet in diameter, sufficiently large to roll over ordinary obstructions such as fences, ditches five feet deep, large stones and undulations in the ground. They should be equipped with means of absorbing shock to such an extent that the airplane will not be hurt if it drops thirty or forty feet vertically, or hits the ground at high speed. There are various forms of hydraulic or air shock absorbers, similar to the recoil mechanism on great cannon, that are quite practical for this purpose. The tail skid, or rear supporting member of a plane, should be in the form of a wheel and should also be retractable.

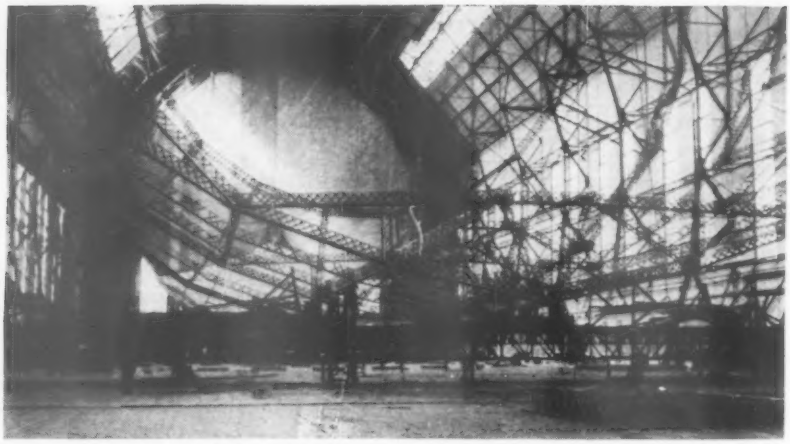
Very good means have already been devised for stopping the run of airplanes along the ground within a short space, not only by brakes on the wheels but also by arresting gears, such as are used on the decks of airplane carriers.

The most efficient landing gear we ever had was the skid, similar to that used on the first Wright plane. This takes up the impact of landing and distributes it over the whole structure of the airplane better than anything else, but difficulty is experienced in taking off from the ordinary field with it. A great deal can still be done in devising new landing gear. We have always tried to get away from wheels but so far have been unsuccessful.

By varying the pitch of the propeller, we are enabled to get an airplane into the air quickly. Many do not understand what the pitch of a propeller is. It may be explained by considering the propeller as a screw and the pitch to be the distance through which the propeller moves in one complete turn. If we put a screw into a piece of wood and turn it around one complete revolution, and it goes forward ¼ inch, then its pitch would be one-fourth inch. In a

Doctor A. Rohrbach, of Denmark, contributes this record-holding Rohrbach Robbe flying boat.





An unusual photograph, taken by General Mitchell at Friedrichshafen, showing the Graf Zeppelin under construction.

similar way, if we turn our air screw around once and it moves the airplane forward ten feet, its pitch would be ten feet, we might say. Various degrees of pitch are better in accordance with whether we wish to obtain climb, that is, to ascend faster, or to attain the maximum speed. Airplane propellers should be made so that their pitch may be varied either in flight or on the ground. Not only does this make it possible for them to climb out of a small field more quickly, but they can ascend more easily in thin air.

When air is heated, it acts like any gas and increases in volume, consequently any given part of it is of less density than it would be when cool. This is a usual condition with which we are faced during the summer in the southwestern United States, at the eastern foot of the Rocky Mountains. To illustrate this point: I landed once at Calexico, California, for fuel, on my way to San Diego. The temperature on the ground was 130 degrees Fahrenheit. From that airdrome, one has to climb to an altitude of about 7,500 feet in a horizontal distance of some twenty miles. When taking off, I had to turn up my engine to its maximum number of revolutions in order to get off the ground, as the heated air was so thin. Not only was the motor giving less power, because the expanded air was deficient in oxygen, but it overheated excessively and the water boiled in the radiator.

Even at full speed, I could not attain the altitude necessary to cross the mountains and had to return to the airdrome and wait for the cool of the evening to make my getaway. Had the plane, a D. H. with Liberty motor, been equipped with a variable pitch propeller, a supercharger on the engine and with modern cooling liquid in the radiator, I would have had no trouble whatever in making the climb.

A supercharger is a device for giving more oxygen to the engine when the air is overheated, or expanded as in high altitudes where the atmosphere is thin. Most internal combustion engines are so constructed that their maximum efficiency is obtained at sea level and in ordinary temperatures. Hence when they operate in air which contains less oxygen, their power falls off, because the explosive compounds used in the engine require a certain amount of oxygen in order that proper combustion may take place. A supercharger gathers in the air, compresses it and delivers it to the carburetor of the airplane and in this way keeps up the supply of oxygen to the engine in sufficient quantities to allow it to work at its full power. As at present made, superchargers are quite simple. Some automobiles use them as standard equipment, and all large transport airplanes should be so equipped.

It is interesting to note that most of our airplane engines need an additional supply of oxygen at about the same time a man does, as he rises in the air. Between 15,000 and 25,000 feet above sea level, the average person requires an additional supply of oxygen to keep all his faculties unimpaired. At high altitude a person's reflexes become languid, his mental processes slow up and he feels lazy and tired. The internal combustion engine feels about the same way.

The structure of the airplane itself should be made of the strongest, toughest and lightest material that exists. The choice of substances changes from time to time as new materials are developed, but at present different forms of metal offer the best solution; not that they are lighter and stronger in all instances, but they offer more resistance to the action of weather than do wooden structures. An airplane is the one great means of transport that can operate equally well in the heat of the tropics or colds of the Arctic.

For many years I have studied the matter of Winter flying. I spent over two years continuously in an Arctic and sub-Arctic country, Alaska, where we get the coldest temperatures in the world. We had many things to learn about cold weather flying. The worst

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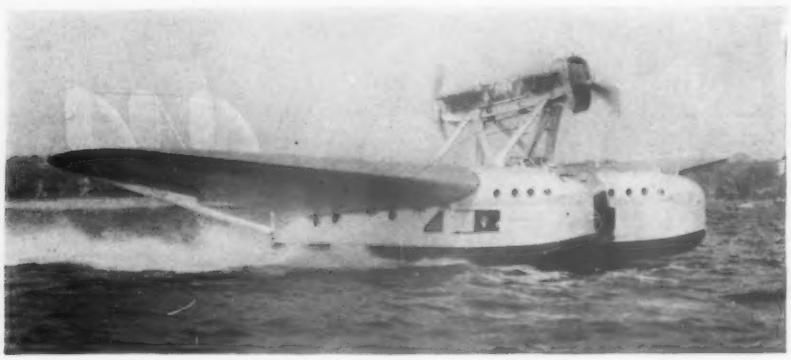


The American Savoia Marchetti Type S-55 is an Italian flying boat manufactured in this country under an exclusive franchise.

ALL THE WORLD'S A MARKET PLACE . . .

by
Z. M. Allison

Mr. Allison recently returned after four years in South America where he served as advisor to several American firms.

THIS is the day of intensive and extensive buying and selling. All the world's a market place. Individuals, corporations and even nations face a situation wherein success depends on the selling of more and more, at less cost in time and money.

In many lines, there is little or no competition in the workshop. Jones and his neighbor Smith make tools. They pay the same prices for raw materials and the same wages to their workmen. Jones has prospered, but Smith is bankrupt. A comparison of cost sheets shows that the prosperous one enjoyed no advantage in the cost of manufacture. The explanation is found in the cost of selling. The two neighbors and competitors turn out a finished product at equal expense, but there is a difference of thirty per cent in the cost of marketing their wares.

The merchant or manufacturer and to some extent the professional man prospers or declines in direct proportion to the efficiency of his marketing machinery. Because of this state of affairs, we have builded gigantic organizations whose business is to determine what the ultimate consumer wants or may be taught to want and how to sell it to him as economically as possible. Statisticians, historians, ethnologists and research workers of many kinds undertake to classify the consumer with reference to race, religion, politics, buying power, etc.

Market analysis has moved into the realm of science. The man who has something to sell can determine who his prospective customers are, what they eat and wear, what kinds of homes they live in, what they read and how much money they have.

The business of market analysis is getting the attention it deserves in the domestic field. With some notable exceptions the same is true of export markets. One of the most outstanding of these exceptions is the astonishing and hardly excusable neglect of the South American market for aircraft.

We have in South America our best and most logical market for planes. It is also a market that can be exploited cheaply when and if the maker and seller of planes proceeds with a knowledge and appreciation! of conditions that are peculiar to South America and have no counterparts in North America.

He, the salesman, must remember that Spanish America and Anglo-Saxon America are as far apart as the poles. Senor Gonzales of Bogota and Senor Gonzales of Lima are charming, cultured gentlemen, but they do not vote the Republican ticket nor eat patent breakfast

Left: The Government landing field at San Salvador. *Right:* The shopping district of Santiago, capital of Chile.

foods nor read the Saturday Evening Post. They are not citizens of the United States of North America and cannot be treated as such.

Neither of these Latin American gentlemen will buy anything from the forceful high-pressure salesman nor from the man who tells the painfully funny story about the traveling salesman and the old colored lady. The fellow who tells his customer the funny story may be a great success at home, but abroad, he's a pest of the first water.

The man from the States who goes south of the Rio Grande to sell aircraft or anything else can and should equip himself with a complete assortment of facts and figures furnished by the Department of Commerce or the Chamber of Commerce. These facts and figures are important and show a picture of the market fairly complete as to population, literacy, buying power, etc. But in the final showdown, the salesmen will find that the buyer chooses a certain product for no good reason,—no reason that can be explained by statistics or mathematics of any kind.

South America is the world's most highly competitive market for manufactured wares. She has almost no manufacturing industries of her own and must import nearly everything she uses in the way of manufactured products. The man who sells to South Americans competes with another salesman who has similar goods to offer at the same price. Each has or seems to have an equal chance, but the man who gets the order has in his favor something we might consider of no importance—something that the buyer and seller in North America would overlook.

It is not the purpose of this writer to make it appear that there is something or anything mysterious about Latin Americans; they are not mysterious, but they are different—of different racial strain—having different traditions and prejudices.

The topography of the Southern continent, especially the northern part, has hitherto presented a transportation problem almost beyond solution. A people that has been isolated because of the lack of means of transportation or for any other reason is likely to develop a psychology of its own and to go on its way unaffected by the changing viewpoints of those who live on the great highways of trade and knowledge.

Bartolome Street, Buenos Aires, the "Wall Street" of the Argentine.

It is with northern South America that the maker of airplanes is most likely to be concerned. It is there that he will find a great storehouse of mineral and agricultural wealth cut off from the markets of the world by towering mountains. There are hundreds of miles of mule paths, but railways and highways are few and far between. This is the part of the world that needs airplanes. Here is the place where it is cheaper to fly than to walk. We will suppose the reader wants to go from a point in the interior of Peru to the oil fields in Venezuela. He has all the time there is, but must make the trip at the least possible cost in money—then he will fly.

Two Yankees recently undertook a trip from Lima, Peru, to Loreto, in the United States of Colombia. There are no railroads or highways. A professional guide offered to get the travelers to their destination in four weeks at a cost of about seven hundred dollars—this amount to take care of all expense including pay for three men and food for eight horses and mules.

One of the Yankees consulted with the United States consul who advised the chartering of a plane. This was done. The passengers were landed safely at their destination fifteen hours after taking off. The trip cost three hundred dollars. The employment of an airplane in this instance saved the travellers four hundred dollars in cash and about a month of their time.

There's a silver mine in Peru that was until a few years ago practically worthless because of the difficulties of getting skilled workmen to bury themselves in the mountain fastness two weeks' journey over the mountains to a town able to provide anything in the way of amusements. Then there was the difficulty and expense of getting the silver from the stamp mill to the mint.

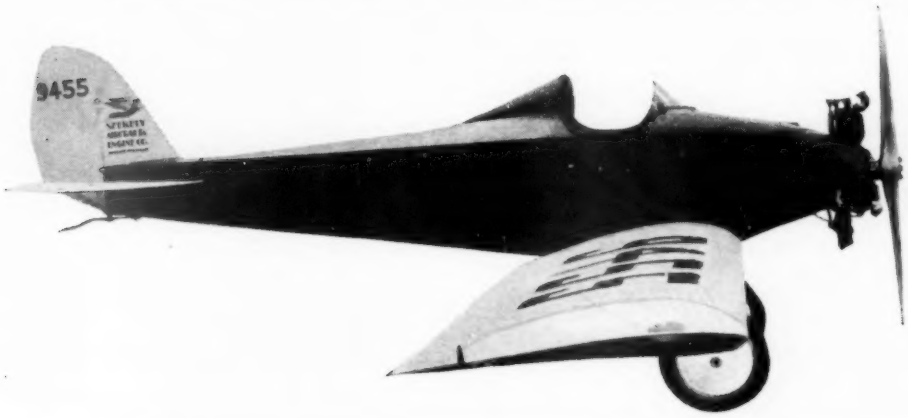
Two years ago, the owner of this mine purchased a plane capable of handling a pay load of about a thousand pounds. In the two years the plane has been in use, the mine has earned more money than in the previous twenty. The silver, ready for the smelter, is always flown to town. Replacements and provisions can be brought out quickly and cheaply. The workmen go to the city as often as they please or at least frequently enough to keep them happy.

[*Continued on page 52*]

A view of a bad stretch in Central America, difficult to traverse except by air.

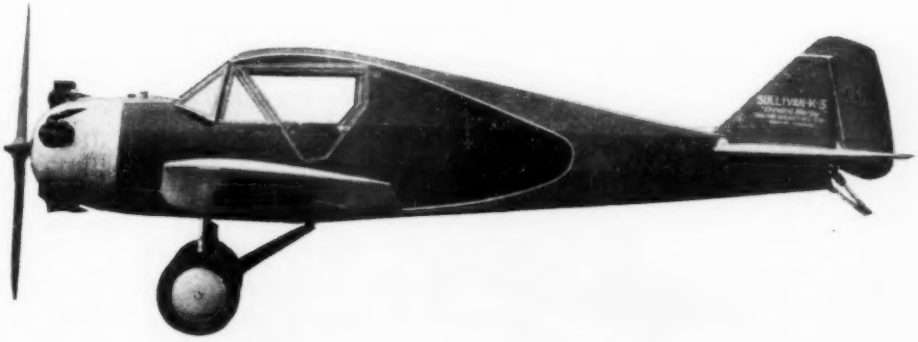
THREE OF THE LATEST

THE Fleetster—an eight place, all metal cabin monoplane built by the Consolidated Aircraft Corporation. It is powered with a 575 h. p. Pratt & Whitney Hornet engine and achieved a speed of 187 m. p. h. on its test flight.



MODEL V Flying Dutchman Monoplane will be the standard production unit for 1930 of the Szekely Aircraft and Engine Company. It is powered with a Szekely 40 h. p. 3 cylinder motor, giving 30 miles per gallon; top speed of 96 m. p. h. and landing speed of 30 m. p. h. Priced at $2,200.

A SULLIVAN K-3 low wing closed monoplane, built at Wichita by the Sullivan Aircraft Manufacturing Co. The sound proofed cabin accommodates pilot and two passengers. A 110 h. p. Kinner motor gives high speed of 132 m. p. h. and 500 mile cruising range at 108 m. p. h.



A LETTER

Cet appareil muni d'un moteur Antoinette de 50 HP. était beaucoup trop rapide pour le pauvre pilote que j'étais à cette époque. Après en avoir cassé trois je dus refaire un appareil plus petit, le Blériot XI, muni d'un moteur de 20 à 25 HP Anzani, et beaucoup moins fin, moins rapide. C'est le Blériot XI qui me permit de faire sérieusement mon apprentissage de pilote.

L. Blériot

TRANSLATION: "This machine, provided with an Antoinette motor of 50 h.p., was much too fast for the poor pilot that I was at that time. After having broken three of them I had to make a smaller machine, the Bleriot XI, equipped with an Anzani motor of 20-25 h.p., which was much less sensitive and less speedy. It is the Bleriot XI which actually enabled me to service my apprenticeship as a pilot. L. Bleriot."

Suresnes (Seine), August 30, 1929.
"AERONAUTICS,"
608 S. Dearborn St.,
Chicago, Ill.

DEAR SIRS:

I have today received your letter of August 15, in which you ask me for an article on the past and the future of Aerial Navigation.

It is now a quarter of a century that I have devoted myself to this science, and it would be too lengthy to expatiate on everything that has taken place. Besides, I have too little time to do that.

However, I will give you some important data that I have retained and which have played a great role in the history of aviation.

It's a pleasure to me to refer to the fact that the United States and France have given one another the hand already from the beginning, in order to provide the world with this mode of transportation.

In 1908 I made the acquaintance of Wilbur Wright and attended nearly all of his experiments. I admired his aeroplane and the control of same, without however approving of the basic idea of his apparatus, as I saw the aeroplane in an entirely different form from that which he had adopted.

Already in 1907 I constructed the

AND PREDICTION FROM LOUIS BLERIOT

Monsieur Bleriot, a renowned pioneer of aviation and now head of the great French organization, Bleriot-Aeronautique, predicts and illustrates the trans-oceanic flying machine of the future.

"Blériot VII," a monoplane apparatus, which has up to the present time remained approximately the prototype of the modern aeroplanes, and of which I send you photographs.

In 1909 the crossing of the English Channel and the competition at Reims gave to aviation its first universal attention, without however adding any really new ideas to the technique.

A very important event which entirely changed the ideas of equilibrium were the experiments of Pégoud, in 1911. It was Pégoud who first looped-the-loop in the air, flew upside down, and made some different experiments such as descents like a dead leaf, which it was wrong to abandon, as these experiments, after all, contained the secret of the use of the sail-spread of the aeroplane for a vertical descent.

Then came the war of 1914 which considerably intensified the building of aeroplanes and enabled me to create the "Spad" which gave us supremacy in the air.

Finally, later, in 1927, I had the joy to receive Lindbergh, a product of your country, who, amplifying the exploit of 1909 came across the Atlantic, to show us the greatness of American aviation.

I could dwell much longer on this question of the past, but I prefer to speak to you of what I consider to be the probable future, as the past should no longer serve for any other purpose than to indicate the way to be followed, to those who analyze it.

In my opinion, it is in speed research that the future of Aerial Locomotion is above all to be seen, and it is in the sane adaptation of this speed that we should center all our researches.

The speed should not be dangerous, and what is wanted is not these fire-ball aeroplanes which lift from the ground after a few meters, as has been the case in various races or record flights.

At this time the comparison between the dirigible and the aeroplane is a live question. The feat accomplished by Dr. Eckener in the "Graf Zeppelin" commands our admiration. It would even seem that the dirigible for the moment is ahead of the aeroplane. However, I do not believe I am mistaken in saying that the dirigible will not long endure the battle with the aeroplane, as its inferiority in speed is too great. This will still more be the case in the near future if the present shape of the Zeppelin, too much elongated, is modified, and its elongation is reduced from the ratio of 10 to 8 or 7. It will always be difficult to succeed in giving the dirigible a speed that would enable it to run against violent winds, and the mid-ship frame required for transporting a passenger will always be from 8 to 10 times greater than that required by the aeroplane.

It is through its considerable range of action that the dirigible strikes our imagination. But the greatest distance that separates two points of land is only 20,000 kilometers, and it is not necessary to run over the whole of it without stopping. As for the possibility of remaining stationary, which seems to be reserved for the balloon, it can only with great difficulty be attained, and in a calm atmosphere.

These two advantages are, besides, compensated for by more serious inconveniences, its fragility, and its volume, which requires garages of extraordinary dimensions, its sensitiveness to the displacement of atmospheric currents, and finally, the danger of catching fire in storms, these things constitute, at all events, a reason why the trip in a dirigible will seem less safe than a trip in an aeroplane, and, besides, for land trips the dirigible has now no advantage. Its great present superiority consists in its fitness for overseas flights. But these routes will

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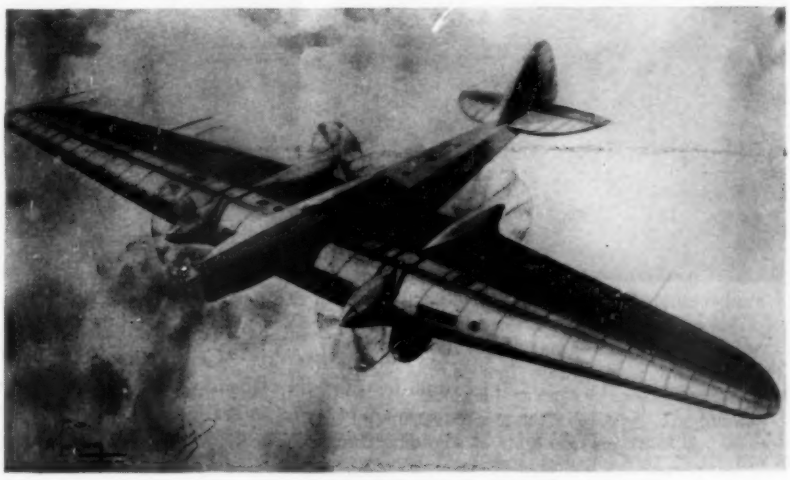


IN THE FLOODLIGHT

Clement Melville Keys

Frederick Brant Rentschler

Vincent Bendix

Graham Bethune Grosvenor

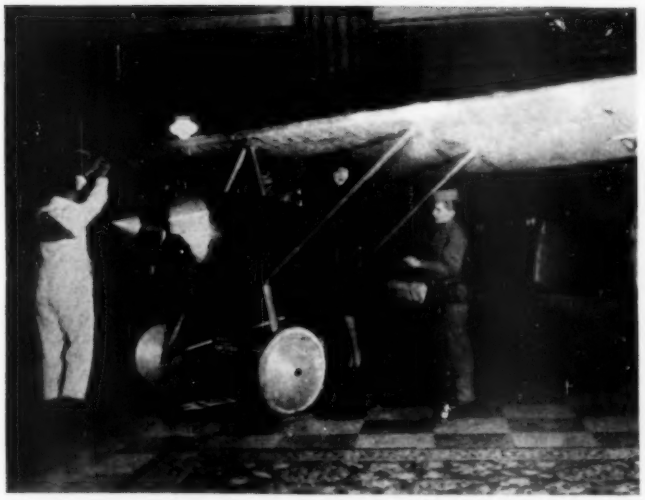
Keys of Curtiss-Wright Corporation, Rentschler of United Aircraft & Transport Corporation, Inc., Bendix of Bendix Aviation Corporation, and Grosvenor of The Aviation Corporation are names of increasing importance in the field of aviation. It is estimated that the four holding companies headed by these men represent 73% of the total market valuation of all aviation concerns listed on the New York Curb and Stock Exchanges.

XUM

DISTRIBUTION PROBLEMS IN THE AIRPLANE INDUSTRY . . .

by

William W. Luftig



An exhibit in the lobby of Benjamin Franklin Hotel, Philadelphia.

THE question of distribution is one of the most important economic problems which confronts the airplane industry at present. The manufacturer is vitally concerned in perfecting his sale organization and the question uppermost in his mind is, "Will I be able to distribute and sell what I have the capacity to produce?" No matter how small or large the manufacturing organization, it must have outlets to the public. Leadership in the industry depends upon distribution methods, and with many producers the marketing problem is overshadowing production itself. Market development will not follow production but market facilities must be prepared in advance of possible production.

Aircraft manufacturers are apparently not very much interested, at this stage of the game at least, with economic theories regarding the wastes of distribution, or the costs of distribution, or the complexity of the problems that separates the manufacturer from the consumer. They are concerned more in formulating merchandising policies and in establishing adequate merchandising facilities. Fortunately, there has been small need for them to experiment with untried distribution mediums. As the selling methods employed in the automobile field have been found to be practically the same as those necessary in selling airplanes, the aircraft manufacturer has taken them over for his own use, with all its wastes and costs and faults, for better or for worse.

The type of commodity or product often determines the manufacturers' selling policy. The merchandising of planes through mail order houses is impossible for the simple reason that people desire service. This cannot be done by mail. Then again, most people want to see and try out what they buy.

Furthermore, mail order distribution involves passive methods of selling and leaves the initiative for buying to the consumer. The airplane industry is not yet at the stage where the airplane is in demand. It must be sold to people who must be educated to its use and utility. However, there are three main channels through which distribution of planes can be sold, namely, from factory to dealer to buyer; from factory to distributor (wholesaler) to dealer to buyer; or through factory branches.

Most manufacturers in the automobile industry use or have used one or more at the same time, and no one channel has been used to the exclusion of the others. Seventy per cent of the automobile manufacturers in business today are relying on the distributing organization as the basis of their merchandising and distribution scheme. The distributor is the backbone of the automobile industry today. Some of the manufacturers who deal in specialized high-priced lines such as the Rolls-Royce, Lincoln and Cunningham have found a direct dealer or branch-to-dealer policy more efficient and economical.

The Ford, DeSoto, Dodge and Oakland cars are also sold without distributors acting as intermediaries between factory and purchaser, but excepting the Ford line, the volume of cars sold without the help of the distributor represents a very small proportion of the total number of cars sold. The branch system, which would probably be more desirable has been used by most manufacturers at one time or another, but has proved unsuccessful because branch managers have never proved as competent as dealers and distributors who have their own money tied up in the business.

The distributor (wholesaler) has survived in the automobile industry by reason of his serving more economically than any other system. Despite the many efforts to eliminate this middleman as a factor in distribution, he is still the hub of the distribution wheel. The airplane manufacturer has accepted him as the means of selling his output. He considers the real problem not so much whether the wholesaler is necessary or unnecessary but what functions in distribution are necessary.

The manufacturer gives the wholesaler exclusive rights in a field comprising one or more states or several counties in a state. The territory is alloted on the basis of sales possibilities. In return, the distributor is responsible for the satisfactory sales development in that territory. A contract arrangement is entered into whereby the distributor agrees to take a predetermined minimum number of planes within a stipulated period.

It is manifestly unfair at this stage of aviation development to hold the distributor strictly to this arrangement, but the manufacturer does expect the distributor to use every effort to reach his quota. The contract is terminable at the option of either party at thirty days' notice. It is necessary for the manufacturer to have a center of supplies at the important distributing points where he has representatives, so that dealers can draw upon the reserves at a moment's notice and not have to wait for shipments for planes or parts from distant manufacturing centers. The manufacturer is thus enabled to ship planes in

[*Continued on page 50*]

MODERN AIRPORT

by Francis Keally

The second of a series of articles by this noted New York architect.

THE tendency of the world's airplane industry is towards permanency. No longer do we care to tolerate the construction of wooden hangars and dust laden fields or to gaze upon planes and pilots or airport architecture that present in their ensemble the same incongruity we feel when we see a square peg in a round hole. Forty years ago our grandfathers were obliged to house their automobiles in barns built for horses. And twenty years later we began the airplane industry by housing airplanes in abandoned factory buildings, in warehouses or in sheet metal garages.

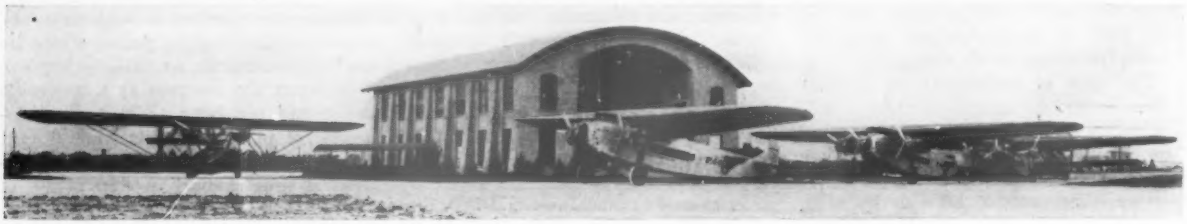
Today this Gargantuan infant airplane industry is off to a start that is unparalleled in the history of the transportation business. Never in its infantile stages did the automobile receive such huge financial backing or such a popular send off. Never did the railroads in their beginning find such ready capital or such imposing and eager passenger and freight lists. Never did the steamships have waiting for them millions of dollars for improvement, nor did they have to fight to ward off a rush for berths. Thus aviation has everything that the 20th century can offer—abundant capital, a ready market, an enthusiastic public and an expanding future.

The air-rail passenger terminal at Pan American International Airport, Miami.

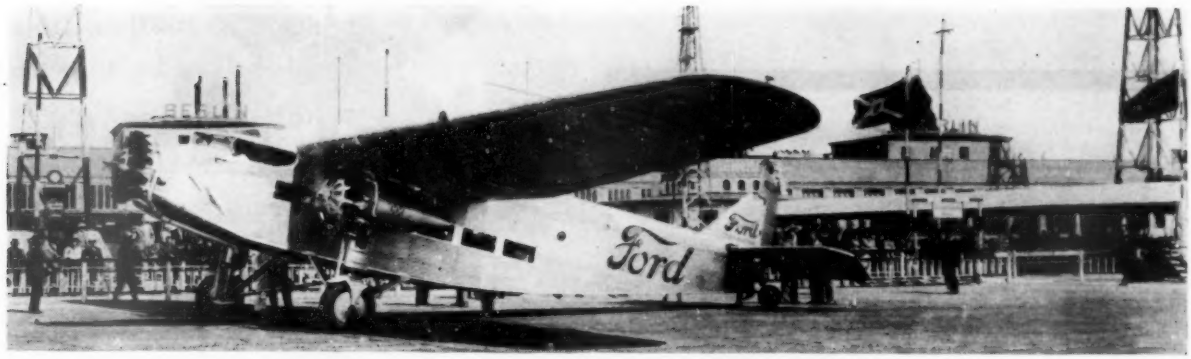
With adequate capital we are able to build a fitting setting for our new industry. The housing of the airplane involves an architectural treatment all its own. It makes special demands for the proper solution of its buildings and airports; as in all good architecture, these must frankly express their function. We cannot justifiably transplant Roman temples to aviation fields. What significance would there be to Greek embellishments on airport buildings? The Greeks never saw an airplane. Consequently in affirming that the airport must have an architecture all its own, the problem is thrown wide open and without reservation to the unfettered architects of our times. It is a field where originality and usefulness will triumph. There is no orthodox precedent for architects to follow because there are no typical precedents whatever. But the building of airports is going steadily forward. Let us, for example, look abroad and see what our air-minded friends of other countries are doing in airport construction. First let us consider the subject of materials.

At Tempelhof, Germany, steel was used in the construction of a huge hangar with red brick surfacing. At Littorio Field, the great Italian Airport inspired by Mussolini, on the outskirts of Rome, reinforced concrete was favored. This gave a very pleasing exterior effect. The architectural character of these structures was planned somewhat after the old Italian palaces. Steel trusses were used for the large span of the roof. At Croydon Field in London, England's magnificent and world famous airport, steel skeleton work with stone exteriors is universally adopted. Compared to brick surfacing for low structures stone is very expensive but it is of course imposing. In some of the smaller of the Continental fields wood has been used. But wood does not have a permanent appearance. Stone, the rock of the ages, is consistently permanent. It lends an air of stability, an atmosphere of unquestioned character and reliability to any structure. At Orley Field in France the great twin dirigible hangars have been built with reinforced concrete and are beautiful and structurally satisfying. Each shed is 984 feet long and each has sufficient space in the roof to permit the installation of passageways one meter wide and at least 2 meters high. The other major dimensions of the hangars are: width, 150 feet; height, 150 feet.

In this country various materials have been used for airport construction, including reinforced concrete, brick backed up by hollow tile, metal and wood. The new airports which Mr. Kenneth Franzheim has designed for T.A.T. are of steel frame construction backed up with hollow tile covered with an exterior finish. The advance drawings which have been published indicate that these new airports will be expressed in very modern



CONSTRUCTION▲▲▲



The famous Tempelhof airport at Berlin.

architecture. Mr. Franzheim's work promises to give us a broad, simple and beautiful composition.

It is not improbable that some metal, of the non-corrosive type, beautiful to look upon, will eventually be used. It is not hard to picture the airport of the future with all its buildings being made of aluminum. The covering would be applied over a steel framework not unlike the application of Celotex. Such buildings would be fireproof, permanent, economical to build, and with proper handling in the design, beautiful. Glass buildings, too, are not improbable.

Among the various details of airport construction none has been discussed with such variance of opinion as the runway. Some of the leading architects and engineers advise concrete for its construction, others asphalt, others heavy cinders, others grass. As far as can be ascertained, time will have to be the judge as to which is best. Consider the requirements of a runway. It must be safe to land upon. It must have good visibility both night and day. It must be fireproof and it must be dustproof.

The entire fields should be of concrete but a decision as to a standard runway material may be reserved because so many different kinds of runways are proper for different types of planes and their uses. Grass on a runway has advantages, yet it is bad in wet weather and its visibility is poor. A runway of cinders is good with respect to landings in that it has a cushioning effect on the landing gear. But it is slow material from which to take off. It has no visibility at night. Asphalt becomes soft in hot weather; it is subject to scarring by tail skids and it is slippery in wet weather. Slag is often recommended, but, like cinders, chunks of slag are liable to be picked up by the propeller and thrown back, ripping the fuselage and damaging the propeller.

The only drawback to concrete is its murderous effect on landing gear. Concrete offers the fastest take-offs and, paradoxically enough, the hardest landings. Its visibility at night under illumination is excellent. At day it has no equal.

But there are combinations of various materials which may also be considered for runway construction. A stone base with a cinder top is one of these but with this construction there is danger of cinders being picked up and thrown back by the propeller. Moreover, it has poor

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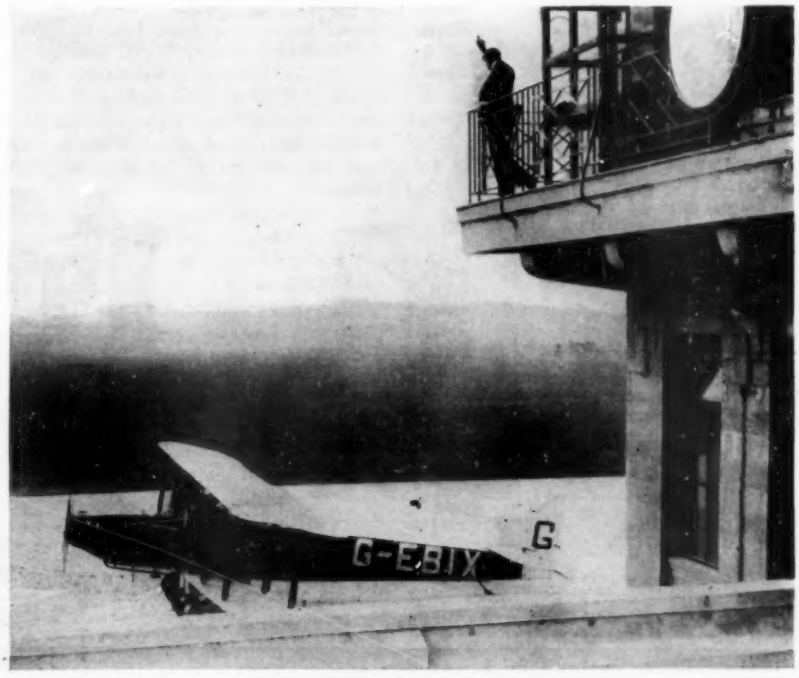
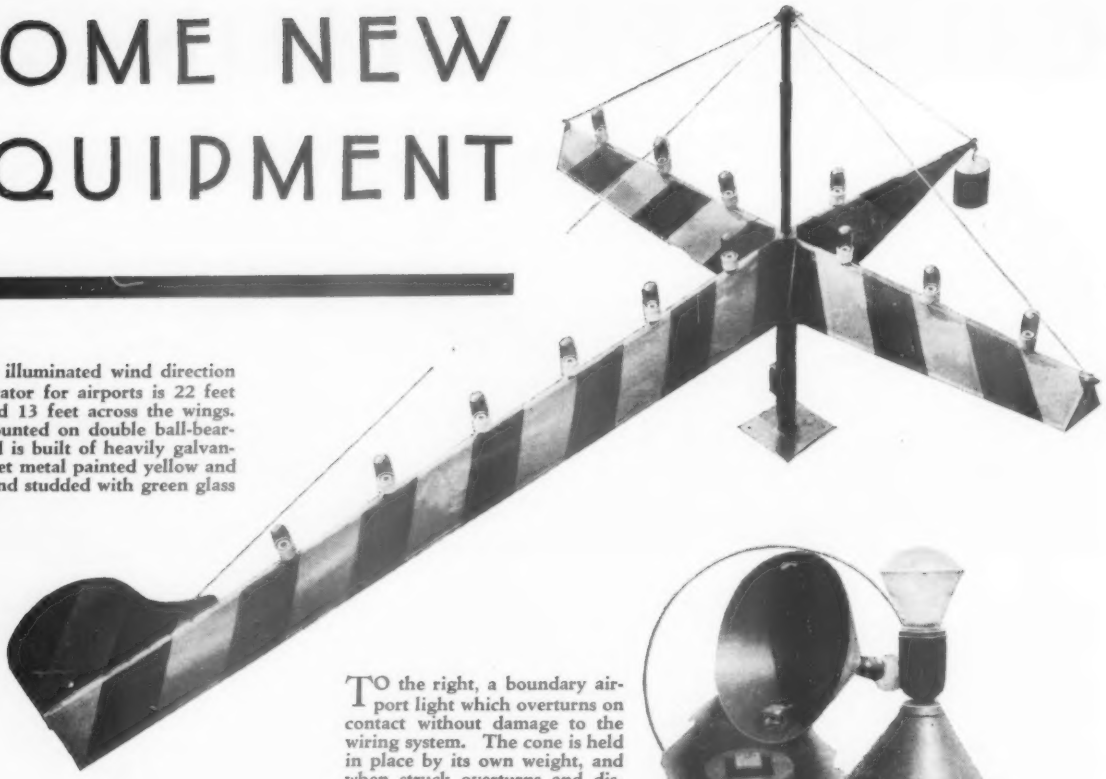
Dispatching an airliner from the control tower of Croydon Airdrome, England.

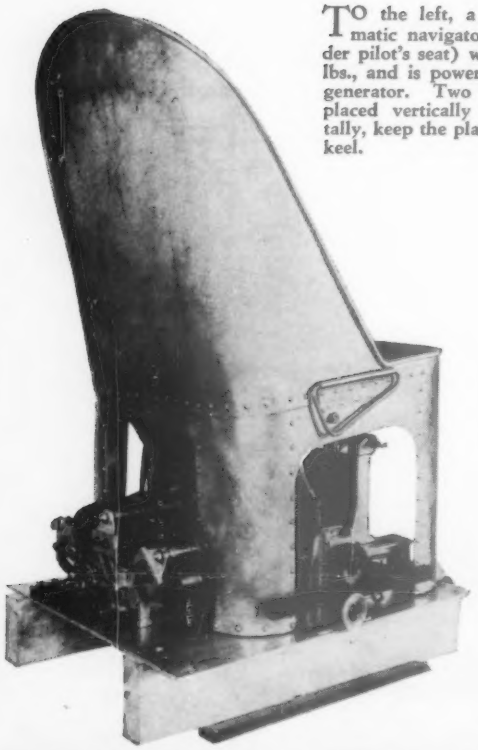


SOME NEW EQUIPMENT



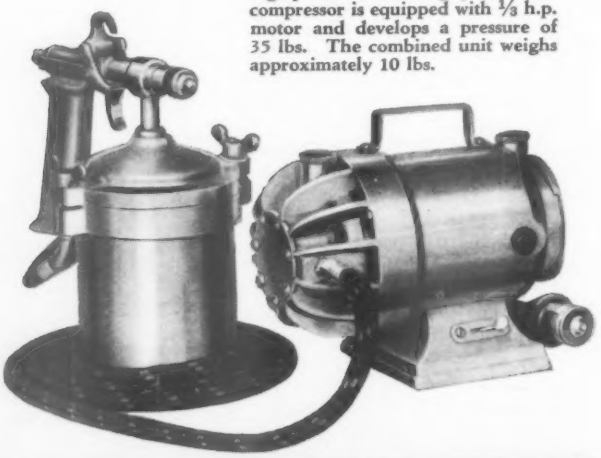
THIS illuminated wind direction indicator for airports is 22 feet long and 13 feet across the wings. It is mounted on double ball-bearings and is built of heavily galvanized sheet metal painted yellow and black, and studded with green glass globes.

TO the right, a boundary airport light which overturns on contact without damage to the wiring system. The cone is held in place by its own weight, and when struck overturns and disconnects the wiring as shown by inset in background.



TO the left, a Sperry automatic navigator (placed under pilot's seat) weighs only 50 lbs., and is powered by a wind generator. Two gyroscopes, placed vertically and horizontally, keep the plane on an even keel.

BELOW, the Tornado portable electric paint sprayer (Compressor Type) designed for touching-up and refinishing jobs. The compressor is equipped with ⅓ h.p. motor and develops a pressure of 35 lbs. The combined unit weighs approximately 10 lbs.



One Day Flying Course

The theory that flying is a difficult art to master is exploded in this article.

TEACHING a student to fly in one day seems a startling achievement when we consider the months of specialized effort required by the average course in flying. To say that a student, who had never before been up in an airplane, began his course of instruction in the early morning and made a successful solo flight the following morning, approximately twenty-four hours later, makes it appear that after all maybe this business of learning to fly isn't the daredevil stunt it is cracked up to be.

Blaine M. Tuxhorn, president of the Tuxhorn Flying School, Inc., located at Municipal Airport, Kansas City, Mo., believed that any average person could learn to fly, and fly safely in a short time. To prove his contention Tuxhorn selected Osborn Beal Shaw, 28 years old, employed by a local motor truck company at the head of their used car department. The fact that Shaw had received no previous instruction, having never been up in an airplane, was determined by an investigation of the Kansas City press.

Shortly after sunrise on August 25th Shaw began his course of instruction. It was originally intended that he should solo the afternoon of the same day. In the late afternoon, however, a severe storm arose and although the student was pronounced ready for his solo flight, high winds and rain prevented the attempt. The following morning after a few minutes of instruction Shaw made a creditable solo flight of about twenty minutes.

While the one day flying course has its unique and interesting features, in reality it was an important experiment to eliminate to some extent one of the greatest drawbacks to aviation, the expense of flying.

Today the expense of securing sufficient training to acquire a transport pilot's license runs into several thousand dollars. To secure a profitable position in the industry requires not only this amount of money but many months of the student's time. Not everyone who flies, however, is going to make it a profession. If aviation is to progress two things are necessary, the average man must be able to purchase and operate a plane at a reasonable cost and he must be able to learn to fly in his spare time and with a reasonable expenditure.

Osborn Beal Shaw, who soloed in twenty-four hours.

It was the realization of this situation that led Blaine Tuxhorn to devise a new theory of instruction that would enable the student to concentrate his efforts.

The conventional method of instruction in the fundamentals of flight today is by instructing the student in one operation at a time. The student is first taken aloft for practice in keeping the ship level in flight. Acquiring a reasonable degree of proficiency in this, he advances to the practicing of turns and banks, followed by practice in the judging of gliding angles, and the actual landing itself.

It was Tuxhorn's theory that flying consists, in reality, of one operation, composed of several component parts, namely taking the ship from the ground, flying it in the air and landing. It was his plan to begin instruction in the entire operation at once and that by repetition the student would acquire approximately the same amount of practice in each operation as was devoted to the entire course.

In selecting a training plane for the feat certain characteristics were deemed necessary for the success of the flight and a Barling NB-3 low-wing monoplane was chosen. Safety being an important factor due to the inexperience of the student, this plane was selected because of its stability, low landing speed, visibility and lack of tendency to fall into a spin. Any plane, regardless of make, may be wrecked by an inexperienced flyer and it was felt that the stability and low landing speed of the Barling would enable any student with the primary knowledge of flying to bring the plane to within a safe distance of the ground where a crash would not prove serious.

Shortly after sunrise Shaw was taken to the field and preparations were made to begin his instruction. The student was first instructed in the fundamentals of flying, explanation being made of the various controls and their functions.

As the student was to begin practice in flying immediately he would have little time to accustom himself to the various sensations encountered in flight before giving his attention to the control of the plane.

To allay any fears he might have regarding the possibility of an accident a common sense lecture on airplane accidents and the actual safety of air travel was given. The student was also impressed with the fact that regardless of the desire on the part of his instructor that the flight be a success, they would not permit him to make his solo flight until he was thoroughly capable of doing so.

Instruction was given by Tuxhorn and L. H. Rhiner, Kansas City pilot. The student was taken aloft for half hour periods of instruction followed by rest periods of fifteen to twenty minutes. The two instructors alternated in instructing the student.

During the rest periods it was endeavored to keep the student from thinking of flying as much as possible. This was done to create the effect of separate flying lessons and to prevent the repeated instruction from becoming monotonous.

During the first two hours of instruction Shaw's efforts showed poor results and his flying was erratic. Shortly after the first two hours, however, he began to

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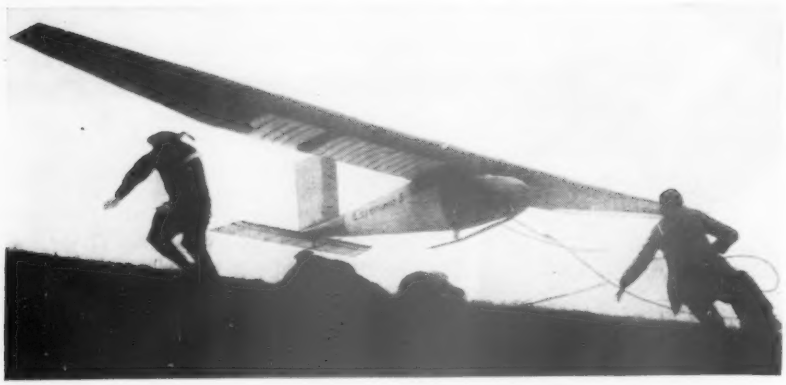
SAILBOATS OF



A critical moment in the launching of a sailplane.

by
Walter E. Burton

A NEW sport has invaded America—one that combines the elements of competition, adventure and scientific fascination. This new diversion is gliding.

The art of flying without a motor has been developed extensively in Germany, and only recently has aroused widespread interest in this country. Gliding was tried by adventurous persons before motored flight was accomplished. Years ago, Lilienthal successfully flew gliders in Germany, and Chanute performed like feats in Chicago. The Wright brothers, before they attempted aerial navigation in a powered machine, gained practical experience in the air by flying gliders. They made the first real soaring flight in America, and still hold the official American record of a little more than ten minutes in the air. This time has been surpassed unofficially by others, notably Peter Hesselbach, a visiting German glider pilot, who cruised four hours over Cape Cod in the summer of 1928, accompanied by flocks of puzzled seagulls.

It is probably true that the flying of motorless airplanes would have been advanced years ago had not the internal combustion motor been perfected to a point where it provided reliable power. Development of motored craft diverted attention from gliders, and they fell temporarily into the discard.

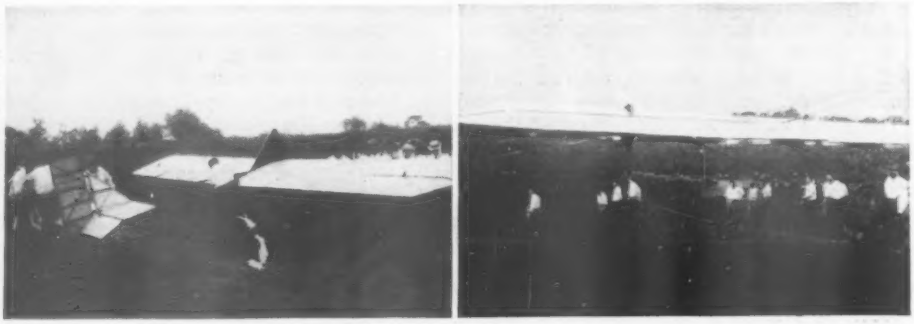
A short time before the World War, young men in Germany, emerging from the airplane model-building class, began to experiment with man-carrying gliders. Efforts were scattered, and glides were matters of seconds or, in rare cases, a few minutes. Then came the war and put a temporary end to gliding. But it is noteworthy that those men who had mastered the art of motorless flight proved to be superior war flyers.

Following the armistice, there was a re-awakening of interest in gliding in Germany. This was largely a result of stringent restrictions on the development of motored machines, imposed by the Versailles treaty. Just as the coming of the automobile engine years before had caused aviation to take a new lease on life, and experiments in gliding to be discontinued, the virtual taking away of the engine caused a revival of earlier research. The renewed activity has led to startling accomplishments. There have been vast improvements in design and engineering until, today, the glider of the soaring type is, scientifically, more perfect than the best motored airplane. There has developed a marvelous degree of skill in piloting the sensitive sailplanes or soarers. Gliding, furthermore, provides a means for scientists to apply theoretical and empirical knowledge in a manner not possible with motored planes or wind-tunnel models.

In 1920 there occurred the first step towards revival of gliding in Germany. A handful of men interested in the idea met and organized the first gliding contest. Their purpose was to apply technical knowledge that they had accumulated to the old problem of making it possible for man to soar like a bird.

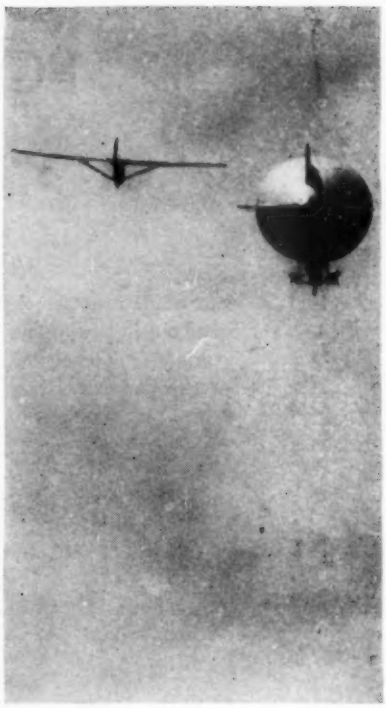
Mount Wasserkuppe, a peak in the Rhön mountain district, rising 2,000 feet above the plain to its north, was selected as headquarters for the contests. All kinds of land surfaces are to be found on its sides. There are smooth, grassy slopes, rough, rocky ones, and gorges filled with fir trees. The mountain itself frequently is surrounded by wet clouds, hence its name.

The first glider meet involved considerable labor on the part of participants.



Left to right: View of primary training glider; shock cord crew in action; the glider pilot seated at controls; holding the tail while the rubber shock cord is being stretched; the glider in flight just prior to the release of the shock cord.

THE AIR



A small blimp towing a glider at Akron.

The sport of gliding is fast becoming as popular in America as it is abroad. In the next issue Ensign C. C. Ward tells about the new Cape Cod Glider School.

They sweated while hauling their machines up the rough sides of the mountain. The camp, a temporary affair, was far from having the comforts of home. Nevertheless, the tests were modestly successful, and served to arouse interest, even though limited, throughout the country.

The following year, 1921, provided the first real glider contest. Attendance was much larger than the preceding summer, and many more gliders were entered. It was during this year that simple gliding developed into the more ticklish business of soaring. Several flights were made of from five to 20 minutes' duration, and some of these covered several miles. These were the first real cross-country glider flights. Interest in the sport became nation-wide, so much so that a society for the promotion of soaring flight was organized. The Rhön mountains have become a gliding center where annual contests are held. The Wasserkuppe is the home of glider schools and a permanent glider research institute. Tents that housed participants in the first meet have been replaced by permanent buildings, and the rough trails have given way to automobile roads. Flyers no longer have to carry their tools, machines and food in a two-hour hike from the nearest town.

The 1922 meet on the Wasserkuppe attracted thousands of spectators, who were thrilled by the man-made birds sailing silently above. Weather conditions were ideal. Spectators discovered that they could carry on conversations with pilots overhead. This was possible because of the absence of a noisy motor, and because of the slow speed of the gliders. Frequently, when a pilot is seeking to establish an endurance record, he drops down to within a short distance of the ground and converses with those below. This method was followed when the first one hour mark was set, and has been repeated frequently since.

Although the "glider bug" has devotees in many countries, it is in Germany that most of the records have been set up. Robert Kronfeld of Vienna, who beat Johannes Nehring's distance record of 64 miles, recently bettered his own record by sailing 93 miles without stopping. In October, 1924, Ferdinand Schulz remained aloft in his sailplane for 12 hours and 6 minutes. Two years later, in May, 1927, he established another endurance record of 14 hours and 7 minutes. As early as 1912, a distance record of 2,700 feet was made by Gutermuth, who used a glider that could hardly be called a sailplane. Dr. Wolfgang Klemperer increased this to 6,000 feet in a flight lasting nearly 2½ minutes. The present altitude record is nearly 7,000 feet. Klemperer, in 1929, was the first glider pilot to arrive at a selected destination in a cross-country flight. He sailed three miles to Gersfeld and landed, making the trip in 13 minutes, and proving that a glider can be flown where its pilot desires.

Passengers have been carried in gliders. In 1923 the Dutch airplane builder, Anthony H. G. Fokker, provided a sensation by appearing at the Wasserkuppe meet with two factory-built gliders, one a two-passenger machine. He had had these built according to instructions ra-

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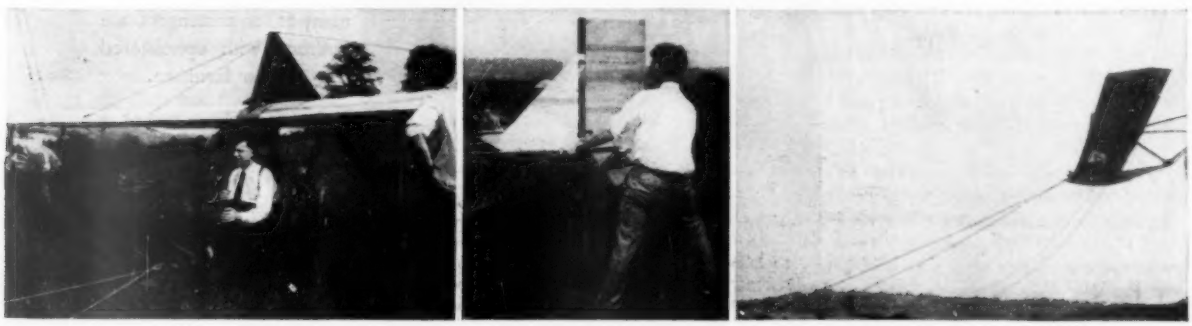

complete expenses of the commercial birdman and photographer who would pilot the plane and make the pictures. It would also cover the transportation expenses of the golf course architect who would accompany the aviator on the mapping trip.

The fact that U. S. Geological Survey is making an enormous topographic map of every square inch of land surface in this country teams well with this modern project of plotting golfing playgrounds from the air. This great government map, which will cost $100,000,000 and will serve as our national topographical yardstick, a standard compilation of all the bumps and dents in America's surface, will be of inestimable value to future exploitations in highway and railroad construction, golf course design, mining and water power developments and the location of prospective new towns and cities.

At minimum cost, Uncle Sam will supply small topographic maps of any unit or fraction of a unit in this stupendous topographic survey. The high cost of golf course design will be reduced greatly in the future as a result of the preponderance of accurate topographic data available from U. S. Geological Survey and the complementary possibility of making strip mosaics and oblique and vertical pictures of potential links from "on high."

An Army type observation plane—a two- to six-seater—is best adapted for aerial golfing surveys of this description. The standard type of aerial camera, which will give the maximum detail at given elevations, is another essential feature of the mapping equipment. This camera is mounted in the fuselage of the airplane with its lens pointed directly downward in making the vertical pictures of the future country club. The oblique negatives are made with the camera mounted at the side of the flying machine. The plane circles the site of the proposed links at a distance of from one-half to one mile until the best point of exposure is reached when the picture is taken.

A technical comparison of the resultant negative enlargements and the topographic maps facilitates the establishment of an accurate scale of measurement on the air-made pictures. Objects of known distance apart, which appear as minute pin points on the aerial enlargements, can also be employed as accurate checks on the faithfulness of the scale thus developed.

Especially in a timbered country where the forest cover is dense and where fairways are veritably "hewn" through a primitive wilderness from tee to green, the importance of the air system of golf course survey is demonstrated. Under other conditions, the golf architect has nothing but a visual-

Designer and camera man about to hop off for initial survey.

ization as the guilding star of construction. He never knows exactly how a certain fairway and green will look from the tee until that hole is completed where the customary ground method of layout is followed. Observations from the air by a trained expert eliminate all such drawbacks.

Your writer knows of many country clubs which paid from $15,000 to $75,000 to eminent golf course architects to plan and build their links. Such inflated costs could have been shrunk to mere shadows of these amounts if the skyland system of survey and design had been followed. Eventuality will see the air method accepted as the first aid of golf course designers. Its ultimate success of course will involve flying experience and ability in aerial photography as prime supplements to the current educational requirements of the golf architect.

One course in the heart of the Adirondacks, a links of unsurpassed beauty, with hazards chiseled by nature, was "cut to pieces" and ruined by present golf architecture practices. The planner felled hundreds of fine trees in order to get the real lay of the land and to convert it into a summer headquarters of outdoor sport. Surveys from cloudland by airplane would have saved much of that forest cover which represented generations of growth and would have resulted in a finer and sportier links at lower cost.

Aerial surveys of ultimate country clubs are made from cloudland cruisers that hurtle through the kingdom of the upper air at velocities of from 80 to 100 miles an hour. The countryside looks flat to the observers in the plane as they fly high overhead from tee to green on certain proposed holes. Under such conditions, the terrain loses its perspective. The topographical details, however, are perceptible subsequently when the flying machine skirts around the proposed course at a distance sufficient to emphasize these hills and dales, ridges and depressions.

The speed of the flying plane that makes the survey is a true measure of the rapidity with which the air pictures of the potential golf course are completed. Operating at top speed, an experienced birdman can make all the necessary air pictures of a regulation golf course in about 60 minutes at an altitude of 3,000 feet. Repeated tests have demonstrated that when the air pictures are made at an altitude of 3,000 feet, an almost arbitrary scale of one-half a mile to one inch is established on the resultant vertical pictures or mosaics. A practical schedule which has proved efficacious is to fly three times around the proposed course at an altitude of 3,000 feet to get the general picture and then to repeat the process at 1,000 feet for details.

The most complicated and time consuming task involved in the production of these air pictures is that of matching the mosaics and fitting them together. Satisfactory vertical pictures are secured at 3,000 feet if the tract in question is fairly square in configuration. If, on the other hand, the property is rectangular or pronouncedly elongated, the birdman may have to climb to an elevation of 5,000 feet to procure the desired vertical "shots."

Major Newman has really adapted modern military stratagems to serve as aides to the goddess golf. For example, an advancing army in war time or during military maneuvers sends skilled aviators on ahead, the scouting spies of modernity. These birdmen accompanied by skilled cameramen photograph the strange country through which the infantry and cavalry will proceed on the morrow's march. The fliers return to camp in time to develop the negatives, match the mosaics, make enlargements and provide accurate information about the lay of the land so that the commanding officer and his staff may plan future movements successfully. Making the unknown known is the goal of both the military aviator and the commercial flier

[*Continued on page 76*]

EXAMINING NAVAL FLYERS

by
Commander
Robert G. Davis

Medical Corps, United States Navy

MAN'S physiological compensations are meeting the new demands of a daily routine. Medicine has ever kept abreast of man's activities, successfully coping with the problems presented, and now the airplane presents a field of unusual demands, requiring the most extensive application of its art in increasing the safety factor. The human organism must be generously endowed with a finely balanced nervous equipment to surmount the stresses of a rapid transit through varying degrees of rarefied air and barometric pressure. Latent defects of the apparently normal will be brought to the fore and gravity will rule, resulting in death and great monetary loss.

The success of the most highly perfected plane design is wholly dependent upon the human element at the controls, and aviation medicine springs forth to assume its responsibilities. The application of higher physical standards early in the war produced immediate improvement in the 90 per cent of crashes resulting from a carelessly selected personnel. New possibilities in aviation became evident, flights were more accurate, the range of activities increased and life extended from hours to years. Each Government was quick to sense the value of these observations and established research laboratories in charge of the highest medical skill obtainable for intensive studies of the demands made by aviation upon the circulatory and nervous systems. The progress of today is the result of the early lessons so dearly learned. The U. S. Army laboratory has become a permanent service school and the Navy has incorporated the Department of Aviation Medicine in its medical school curriculum.

It is universally recognized today that only the physically fit should fly, but special factors, such as temperament, reaction time, and mental development must be stressed, that may assume a minor degree of importance in the physically fit for less hazardous fields of endeavor. With the rapid expansion of non-military flying, the civilian physician can render a valuable service in this new branch of preventive medicine. A few of the more practicable essentials of the physical and psychological examination will be mentioned in the brief scope of this article.

A searching psycho-analysis must be made to determine the trends and potentialities and any hidden defects, either inherited or acquired, that may become magnified and motivate conduct from the insidious fatigue experienced in rarefied air. Fainting, dizziness, acute mania, and even epilepsy may first become manifest in the air. Reactions, both muscular and visual, must be automatic to surroundings, supported by a resolute judgment and decision. Delayed reactions mean disaster in aviation. The temperament should be cheerful, stable, and self-reliant; the volition, energetic and controlled with a good tenacity of purpose. A keen desire to fly is the prime requisite. The train of thought must not be diverted by objecting relatives, financial worries, or other unsolved conflicts.

Pertaining to the physical side, the eyes are of first importance. They must not only present a minimum visual acuity of 20/20, but a perfect balance of each muscle, allowing the maximum field of binocular vision with no tendencies to double vision or oscilatory movement of eyeballs. The phorometer—a sensitive instrument—may reveal hidden and spasmodic defects easily influenced by a lowered oxygen fatigue. The angles of convergence and divergence must not be restricted and all coordinated movements prompt and free from lagging. The sound reception and conduction mechanisms of the ears are carefully tested. The drums must be free from wax, inflammations, and scarring; the eustachian tube potent for equalizing pressures during rapid descents. The balance sense is tested through each semi-circular canal by the rotational chair and the resulting rotation of eyes and falling manifestations compared with the normal. The nasal passages must be free, as altitude greatly aggravates any tendencies to obstruction. Mouth breathing produces pyorrhœa, inflammation of the gums, tonsilitis, and headaches from defective sinus drainage. There must be free breathing from a healthy respiratory tract.

Correct respiration is manifested by an upward movement of the lower ribs with the diaphragm contraction and a complete air capacity of lungs after full inspiration is dependent upon a complete muscular emptying. Flack of the Royal Air Force has defined the physically fit as one who in response to physical effort is able to maintain his "ventilation ca-

XUM

pacity" at a high level during the period of performance. He can withstand a much less partial pressure of oxygen than the unfit before symptoms of respiratory instability and circulatory embarrassment appear. This is most important to the aviator who must make rapid adjustments in rarefied air.

The best circulatory efficiency is found in a pulse of 72, not markedly increased by exercise and followed by a prompt return to normal. The pulse pressure is the difference between the upper and lower readings of blood pressure measured in m.m. of mercury. For example:

Blood pressure 120/78 — pulse pressure = 42.

Systolic or arterial pressure is 120.

Diastolic or venous pressure is 78.

A continued fast pulse points to a general physiological insufficiency not sought in aviation. High blood and pulse pressures are apt to break under severe physical and nervous strains; low pressures lack stamina and tend to fainting. Heart muscle changes should be excluded by the electro-cardiograph and any vessel changes carefully evaluated. Hardening of arteries from alcohol or lues must be excluded. The Schneider index affords a rapid and comprehensive method of determining the circulatory efficiency not only for the acceptance examination, but during the pilot's performances.

It is dependent upon six factors: (1) the reclining pulse rate, (2) the standing pulse rate, (3) the difference between the reclining and standing pulse rates, (4) the difference between the standing pulse rate and the rate following a standard exercise, (5) the time for the pulse to return to the standing rate after the standard exercise, and (6) the difference between the reclining and standing systolic pressures. From a large number of observations, an arbitrary value of minus three to plus three has been given to each varying factor with a maximum plus total of eighteen. A score of seven is unsatisfactory, while fourteen to eighteen is excellent. Great interest is shown in an operating squadron when the weekly scores are posted.

A new sense is developed in aviation, namely, the "flying sense," dependent upon vision, hearing, balance, tactile and deep muscle sense. All are brought into action at the most critical part of the flight called the stalling point, which terminates the flying speed. Occurring in the air, a gravity drop results requiring a dive of several hundred feet to again gain control, proving fatal should it occur in leveling off too high in approaching for a landing. The deep muscle sense and the wind on the cheeks differentiates between the faint and strong controls, the light and firm seat pressures in acquainting the pilot with the "feel of his plane." Forced landings over unfamiliar ground require all his intuition and training supported by a background of physical and nervous equipment that will not fail. The flying sense is only developed and retained by frequent flying, stopping short of fatigue when perceptions become dulled and reactions slowed.

Continued flying without proper intervals of rest produces a condition of lowered nervous efficiency known as staleness. It may appear as a heart and lungs type with a rapid, shallow breathing and cold extremities, accompanied by a rapid and weakened pulse; a nervous type showing poor muscular control, exaggerated reflexes, fine tremors of hands, tongue and eyelids, nightmares and insomnia; a muscular type presenting rheumatic pains in tender and flabby muscles. Any of these symptoms occurring in an aviator call for an immediate rest, corrective dietetic measures, and a change of environment. Recovery is usually complete in a few days and the deteriorating flyer is restored to his former degree of safety.

No phase of a medical officer's activities in the military service requires such a close observation of personnel as aviation presents to the flight surgeon. His responsibilities have only begun after the flyers are accepted and trained. To detect the earliest signs of insidious deterioration, he must know the pilots intimately, observe them daily on the ground or in the air and be conversant with their habits while off duty. Frequent conferences are held for the discussion of general health principles, including the values of regular sleep, good food, recreation, and abstinence from alcohol. The latter predisposes to fatigue with dulled vision and muscle sense, accompanied by a careless abandon in the air. Flying with one wing low, rough landings, etc., are often due to wax in the ears or a faulty depth perception preventing a proper appreciation of balance and the landing terrain. Hasty checks in the field dispensary will reveal the causes before the defects have become known to the pilot. He is cooperative and interested in all that is done and will often ask to have his circulatory index compared with previous scores, realizing that his greatest safety factor is physical fitness.

The greatest psychological factor in getting close to a pilot is flying with him or his squadron, experiencing his emotions and strains, as well as sharing in his enthusiasm. An unusual comradeship exists between personnel undergoing the same hazards and on short or extended flights the flight surgeon renders a subconscious sense of security and is present to detect the first signs of the physical or psychological abnormal.

Candidates for aviation in the Naval Service are selected from young volunteers throughout the fleet, preferably in their twenties, who have completed two years of general sea duty. These young officers are given the two or three hours' searching physical and psychological examination by a flight surgeon who has had special training in aviation medicine and is armed with the special examining equipment. After approval by the Navy Department, the candidate is transferred to Pensacola, Florida, to undergo an intensive three months' course in the ground school, mastering the mechanics of flight, radio, engines, and plane construction. If successful in this part of his training, he is placed in the hands of specially selected instructors for training in the air. After ten hours of dual instruction, he should be able to solo and advance to the various types of planes and maneuvers used in the Naval Service. Graduation with the coveted wings insignia occurs only after a special board has passed favorably upon every phase of his performances.

The flying activities of the Navy are varied as to type of plane and duty required. Bombing, scouting, torpedoing, observing and combat maneuvers are performed by both land and seaplanes flown under trying and often most adverse weather conditions. Aviation has now become an important arm of the fleet, accompanying it at all times. The small combat planes carry out daily battle maneuvers and all pilots must be trained in gunnery and acrobatic exercises. The smaller hydroplanes are hurled from the catapults of the cruisers and battleships to hover over the targets beyond the horizon, reporting by radio the result of each shot from the long range guns.

Larger seaplanes, manned by a crew of four men, are used for bombing and towing target sleeves for the anti-aircraft batteries. Photographic and observers' planes are high above both land and sea maneuvers, while stationed below in the midst of surface activities are the flight surgeons, ready for immediate dispatch to the scene of an accident, either by plane, ship or motor ambulance. Motor failures are the constant concern of all planes, particularly those of land planes flying over water and also hydroplanes, which are quickly damaged in heavy seas. Each plane is provided with well equipped first aid packages protected by water-tight casings and all the personnel are thoroughly trained in their use. Speed boats and ambulances are supplied with first-aid appliances and tools for clearing away wreckage, manned during flying hours and ready for instant dispatch.

Every possible safeguard is offered the aviator to preserve his faculties and lessen wound or injury should accident occur. Electrically heated suits combat the lowered temperatures of altitude,

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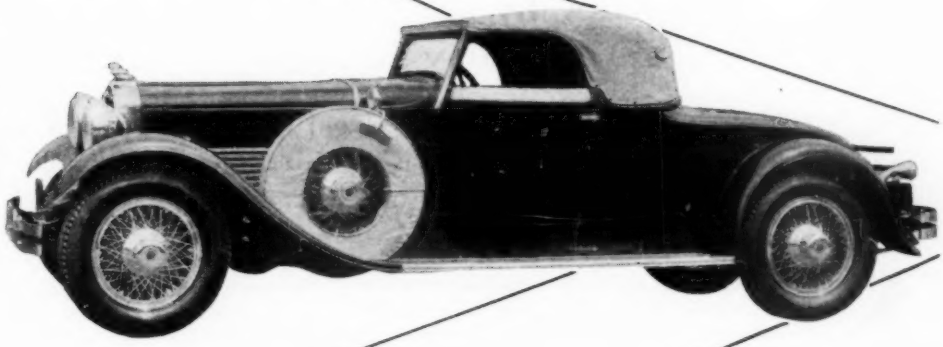

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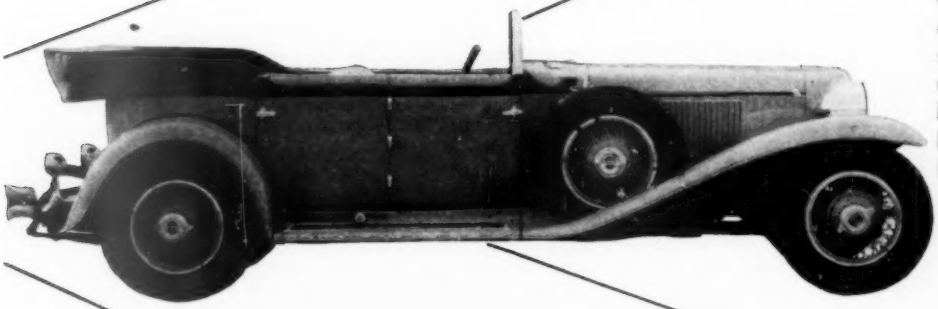

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AIRPORT

Aeronautic Law

by
Bailey Samelow

A discussion of the legal interpretations of insurance claims resulting from aerial accidents.

"A" WENT to a local airport to watch his friend, "B," put his plane through various manœuvers.

"How would you like to go up with me?" "B" asked.

"I sure would," replied "A" and the two went for a flight. In attempting a theretofore untried manner of landing, "B" crashed his plane and "A" was injured.

"Honey," said "A" to his wife, who visited him later at the hospital, "don't you worry—my accident insurance policy will pay you, weekly, enough to get along on well, while I am laid up."

But the insurance company refused to pay out any money on the policy, contending that "A's" policy did not cover him while participating in an aeronautic activity as a passenger or otherwise, and the courts would uphold this contention.

With the steadily increasing use of aeroplanes, such cases will frequently occur. Many sad experiences will be prevented if one will carefully scrutinize his policies to ascertain whether they contain prohibitions against participation in aviation, and whether the provisions contained in the policies cover the type of flying which the insured expects to undertake.

Being a passenger, of itself, should not be considered as participating in aeronautics. It would seem as absurd to say that a passenger on a railroad train participated in railroading. However, in Florida, Missouri and New Jersey, courts have held to the contrary, though such is not good law. If it is the intention to exclude one from participating in the physical activity of aeronautics, such as the management or control of aircraft, the proper phraseology should be to exclude anyone engaging in piloting, operating or managing of aeronautic vessels. This, of course, would not include passengers, observers or photographers.

Before insuring anyone, the insurance companies require the applicant for a policy to fill in a printed application for insurance. Their purpose is to ascertain, from the application, whether or not the applicant is the sort of risk they want to cover.

An answer to an application for insurance is true or untrue at the time it is given. For instance, if on the day one signs an application that he did not contemplate participating in any form of aerial navigation, but within the next week after the policy is delivered he takes a flight and is killed as a result, no defense could be made by the company on the ground that the victim falsified. However, if he had a trip in contemplation at the time he made the application for the policy and answered untruthfully, his answer is considered such a material representation as is sufficient to void the policy.

Some jurisdictions hold that irrespective of the cause of death, a policy is void if a misrepresentation is made in a policy application; others, such as Missouri, for instance, hold that a policy is not void under such circumstances, unless the loss occurred by reason of the very thing intended to be excluded.

If an application for insurance is satisfactory to them, the insurance company issues a contract to the applicant which is known as an insurance policy. This policy sets forth the risk assumed by the company and the conditions upon which the policy is issued. If the language is uncertain, the courts construe the policy favorably in behalf of the insured and against the insurance company. This is because the policy was written by the insurance company and the theory of the law is that it was written for the benefit of the insured.

Of course where a policy clearly covers a situation, it is enforced as written. The advisable thing, therefore, for an applicant to do is to read carefully the application for insurance, and have any point he doesn't understand explained to him.

Among the interesting cases wherein policies were construed by the courts was the case of Ridgely vs. Aetna Life Insurance Company, 217 N. Y. 720.

This was an action by Ridgely, who was injured while experimenting with a Curtiss biplane, to recover under a policy of accident insurance. The plaintiff, in his application for insurance, stated that his business was that of a financial writer and reporter. The policy provided that "if the insured is injured after having changed his occupation to one rated by the insurance company in a more hazardous class than the premium paid by the policy covers, or while temporarily or otherwise engaged in doing any other act or thing pertaining to any other occupation so rated (except ordinary duties around his residence or while engaged in recreation) the company's liability shall be only such proportion of the principal sum or other indemnity as the premium paid by the insured would have purchased within the rate and within the limit fixed by the company for such more hazardous occupation."

The evidence at the trial disclosed that about one year prior to taking out his policy, Ridgely became interested in aeroplanes and had been experimenting with models during said entire year, and that he was experimenting with an aeroplane at the time of the accident.

Ridgely's contention that he was engaged in recreation was denied by the court, which held that such was not the meaning of the policy and that his application to the insurance company, stating that he did not contemplate entering into any hazardous occupation, was false and, therefore, denied him full recovery on his policy.

In the case of Wendorff vs. Missouri State Life Insurance Company (Mo. 1927), 1 S. W. (2d) 99, a seaplane, because of engine trouble, was forced to descend at sea and shortly thereafter was capsized by the waves, drowning the insured. His policy contained a provision excluding liability from death or injuries sustained while in or on any vehicle of aerial navigation or in falling therefrom or therewith.

The deceased's beneficiary contended that he was accidentally drowned, and that his death did not result from or with an aerial device, and that it was not

[*Continued on page 84*]

Alexander Klemin
Professor of Aerodynamics, College of Engineering, New York University

Article 15
Modern Airfoil Theory

AERODYNAMICS

LANCHESTER in England and Prandtl in Germany have evolved what is known as the Vortex Theory of the Airfoil, which has advanced tremendously our understanding of aerodynamic phenomena. It is quite possible to understand the general theory of the airplane and even to design aircraft without a knowledge of this theory. Yet the vortex theory opens up such new vistas that our readers will be well repaid by an elementary study of this theory.

Why a Rotating Cylinder Lifts

The mathematicians have a conception of a perfect fluid, that is a fluid which has no viscosity. In such a perfect, nonviscous fluid all bodies are perfectly streamline and experience no resistance to motion.

The value of this conception of a perfect fluid is that the flow in such a fluid is easily calculated for simple bodies, and at least approximates the flow in an imperfect fluid such as air or water.

Thus mathematicians can calculate the character of the flow round a cylinder, which is shown in Fig. 1. The flow is perfectly symmetrical below and above the cylinder, as we would expect it to be.

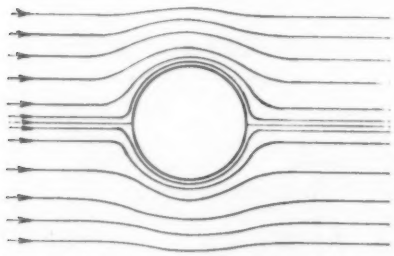


Fig. 1—Stationary cylinder in perfect fluid.

In an imperfect fluid the flow round the cylinder is of the character shown in Fig. 2. The fluid gradually retarded by friction of the surface, tears away from the surface and forms the eddies we show in this diagram.

If a cylinder is simply rotated in an imperfect fluid, the fluid is set into rotation or circulation as shown in Fig. 3. A pebble thrown into a pool causes a

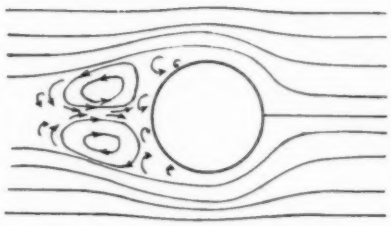


Fig. 2—Stationary cylinder in viscous fluid.

wave motion or ripples which extend to the furthermost confines of the pool. So when the cylinder is rotated, the fluid is set into rotation not only at the surface of the fluid but throughout space, though the fluid moves much more slowly far away from the cylinder.

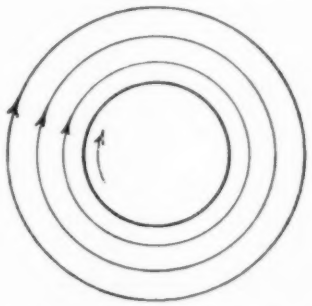


Fig. 3—Cylinder in perfect fluid with rotation alone.

Now suppose we have fluid flowing past a cylinder and the cylinder rotating at the same time. The rotation of the fluid speeds up the flow above the cylinder, and retards it below.

The combination of the flows of Fig. 1 and of Fig. 3 therefore results in a flow such as that shown in Fig. 4. The fluid above the cylinder flows faster and on a more distorted path.

Now we learnt in an early article that where the flow is rapid, the pressure is low and vice versa. Therefore in the cylinder of Fig. 4 there is a region of suction above and a region of pressure below. Accordingly the cylinder experiences a lift force in the direction shown.

The fact that a cylinder rotating in a stream of air exercises lift is the explanation of many phenomena.

Flettner's famous rotor ship was based on this principle. Two large rotors were rotated by electric motors and with the wind abeam a powerful propulsive force was obtained. Flettner's Rotor Ship is shown diagrammatically in Fig. 5.

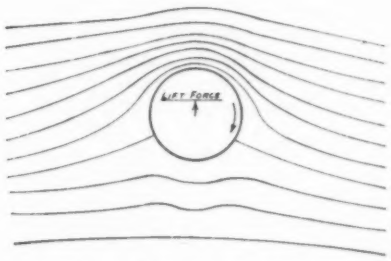


Fig. 4—Combination figs. 1 and 3.

A baseball may be given a special "curve" by an appropriate spin about some axis.

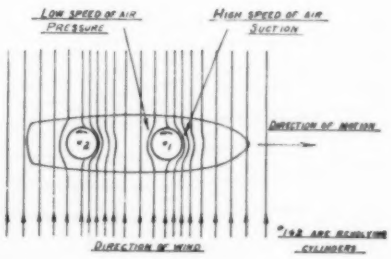


Fig. 5—Flettner Rotor Ship.

A golf ball may be made to have a short, very high trajectory by striking it above mid-axis.

Circulation Theory of Airfoil Lift

The flow round a typical airfoil, in a perfect fluid, would be like that shown in Fig. 6. Of course, there is no perfect fluid, and such a flow round an airfoil could only occur at exceedingly low speeds. We can imagine that at the very

start of the motion of an airfoil such a flow occurs for a very brief instant. The reason that this flow cannot persist is because the air has to go round a sharp corner at the trailing edge. To go round

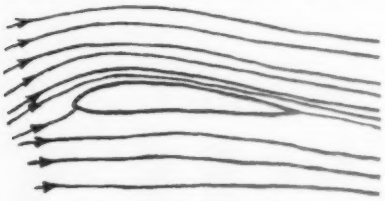


Fig. 6—Airfoil in perfect fluid.

such a sharp corner it has to go very fast indeed, and owing to the viscosity of the air, it starts dragging the adjacent particles of air with it and forming a vortex at the trailing edge. By a species of internal gearing, the formation of the vortex at the trailing edge is accompanied by circulation or rotation of the air round the wing. (Fig. 7.)

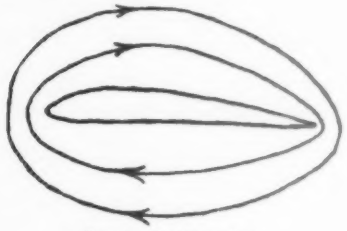


Fig. 7—Circulatory flow.

The combination of the flow of Fig. 6, with the circulatory flow of Fig. 7, gives the resultant streamline flow of Fig. 8. The circulation round the wing speeds up the air above it and produces suction; slows down the air below and produces pressure under the wing. Accordingly lift is produced by circulation just as in the case of the lifting cylinder.

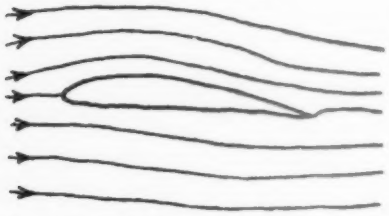


Fig. 8—Resultant streamline flow combination of figs. 6 and 7.

It can be shown by fairly simple mathematics (though beyond the scope of these articles) that the lift of a wing is proportional to

(a) The density of the air
(b) The velocity
(c) The length of the wing
(d) The intensity of the circulation round the wing.

Tip Vortices

It has been definitely established both by theory and by wind tunnel experiments that certain vortices are produced towards the tip of the wing. Let us study the diagram of Fig. 10. Since there is pressure below the wing and suction above it, there must be an end flow, as shown in Fig. 9, from below the wing to its upper surafce. This end flow is superimposed on the general flow past the airfoil, so that at the trailing edge the air above the wing flows partly towards the center of the wing, and the air

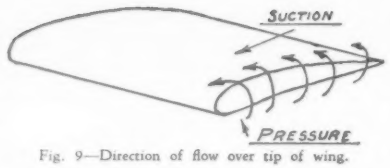


Fig. 9—Direction of flow over tip of wing.

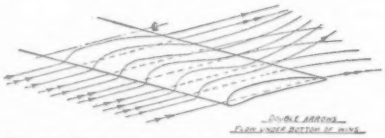


Fig. 10—Flow over top bends in and flow under bottom flows out.

below flows partly away from the center of the wing. Hence an eddy or vortex is formed which trails behind the wing as shown in Fig. 11.

Another Way of Explaining Tip Vortices

Lord Kelvin has shown that if there is circulation round a line, either the line is

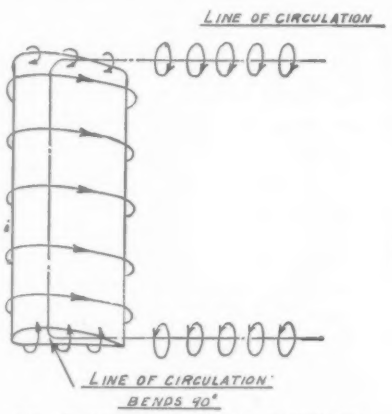


Fig. 11—Arrows indicate direction of circulation.

closed on itself or else its two ends extend to infinity. This idea is illustrated by Fig. 12.

Now consider that imaginary line in the wing, which is the center of the circulation.

Beyond the ends of the wing, there is no lift and therefore no circulation. Therefore in accordance with Lord Kelvin's law, the central line of circulation must, at the wing tips, bend at 90 degrees and produce tip vortices as in Fig. 11.

We have thus demonstrated the existence of tip vortices by two independent methods.

Vortices Really Leave Rear of Wing All Along Its Span

With a wing of exactly the same cross-section or profile all along its span, it might be expected that the lift per unit length of span would be the same all along the span. In actual fact, the lift

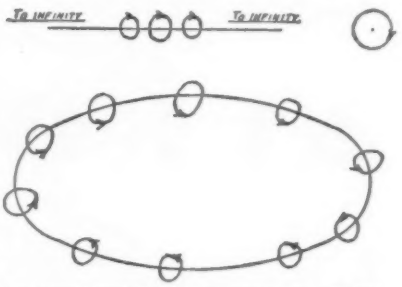


Fig. 12—(Above) Circulation around a line. (Below) Circulation around a closed curve.

falls off rapidly at the tips, much in the way indicated in Fig. 13. Wherever there is a decrease of lift, there is also a decrease in circulation, and since circulation cannot be destroyed, vortices pass off from the trailing edge of the wing all along its length as shown in Fig. 14.

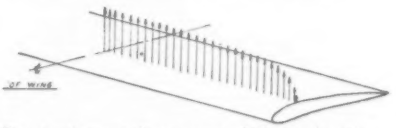


Fig. 13—Arrows indicate amount of lift at each section.

These vortices or vortex filaments attract each other and roll up into a sort of rope (Fig. 15) towards either wing tip. It is therefore quite proper in elementary theory to calculate as if we had a single tip vortex at either end of the wing.

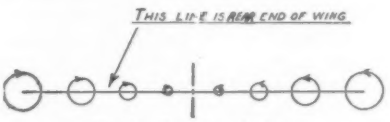


Fig. 14—Rear view of wing.

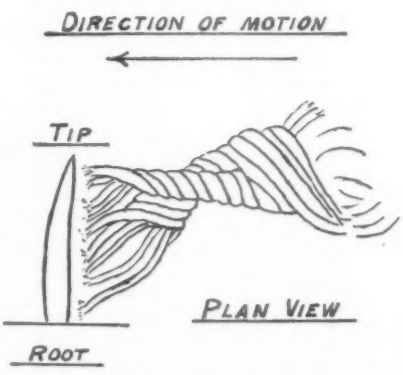


Fig. 15—Vortices all along span roll up into rope-like shape which can be considered as one large vortex at each tip.

Tip Vortices Produce Induced Drag

Let us study again the diagram of Fig.

[*Continued on page 68*]

AERIAL NAVIGATION

RADIO AIDS AND HOW TO USE THEM

by
Cdr. Douglas G. Jeffrey, R. N.

IN the last article of this series that appeared in the December issue of AERONAUTICS, the various types of radio aids to navigation were described and it is now proposed to consider the practical application of the three principal systems, namely, the Rotating or Fuselage Coil, the Fixed or Wing Coil, and the Rotating Beacon.

It has already been explained that by means of a rotating coil the bearing of a radio station with relation to the head of a plane can be obtained. In practice it has been found that the simplest way of handling these bearings is to fall back on the old gunnery method (familiar to all navy men) of referring to all bearings on the starboard hand as "Green" and to those on the port hand as "Red"; thus

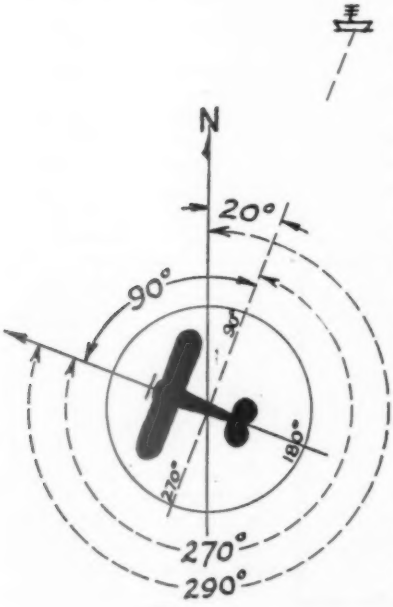


Figure 1.

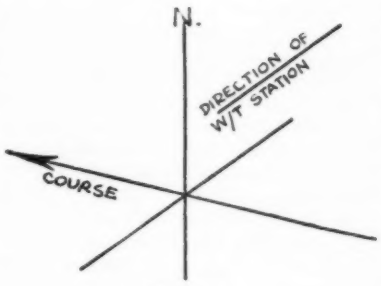


Figure 3.

"Red" 90′ or "Green" 60′, indicating that the object referred to bears 90′ degrees to port (left) or 60′ degrees to starboard (right) from the direction of the plane's head. This is the method in force in the Royal Air Force.

This correction is carried out as follows: Find 45° "Green" on the horizontal line (Fig. 4), take the reading of the course vertically above or below this point and take up the correction in degrees plus or minus. By addition or subtraction the correct scale reading is obtained. This scale reading is relative to the course of the plane at the moment of observation and not the meridian and so the scale reading must be applied to the true course in order to obtain a true line of bearing. Taking Figure 1 the true bearing of the radio station must be the true course plus the corrected green scale reading. In Figure 2 let us assume a true course of 310° and a corrected scale reading of 164° then the bearing of the radio station is 310°—164°=146° (true).

As the coil is turned from its fore and aft position, pointers move over two scales graduated from 0 to 180, the Starboard angles being marked in Green and the Port angles in Red. Fig. 1 represents a plane steering 60 (true) and the navigator has aligned his coil along the path of incidence of a radio wave. The scales will only indicate the direction of the path of incidence and may read either 45° "Green" or 135° "Red," these being reciprocal bearings. The plane's approximate position as shown by dead reckoning will have to be used in deciding whether the wave is approaching from A or from B.

Assuming in the example given that the transmitting station was on the starboard hand and that the bearing was Green 45°, this bearing must now be corrected for quadrantal error. This error, which exists in all aircraft and which forms one of the chief drawbacks of the Rotary or Fuselage Coil Method, is caused by the metal used in the structure of the plane and may be considered as having the effect of two coils at right angles, one lying fore and aft and the other athwartship, the latter usually being the stronger. All

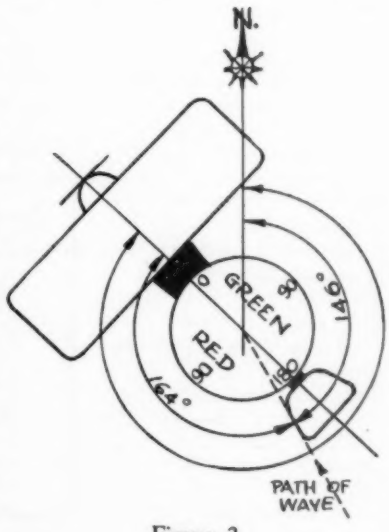


Figure 2.

waves except those coinciding with the fore and aft and athwartship lines are liable to this error, the effect varying according to the direction of the waves relative to the aircraft. These errors cannot conveniently be compensated and are therefore recorded and allowed for, and a Quadrantal Error Card and curve is prepared for each individual machine in much the same way that deviation cards and curves are prepared for aircraft compasses (see Table I and Fig. 4). To obtain a correct line of bearing this allowance for quadrantal error must be applied to the scale reading and the compass course must be corrected for variation and deviation. The corrected scale reading is then referred to the TRUE course and the TRUE bearing of the transmitting station is obtained.

The following rule always applies: "To obtain the true radio bearing ADD corrected green scale readings and SUBTRACT Red scale readings from true course of aircraft." An example worked in detail follows:

A bearing of a Radio station known by dead reckoning to be about N. W. of the plane is taken. The course being steered 286.6° by compass at the moment of taking the bearing. Scale reading 50° red variation 8° west and deviation 2° east. It is evident (see Fig. 3) that the scale bearing cannot be 50° red and it must therefore be the reciprocal bearing 130° green.

Scale Reading Given	50° Red
Amended Scale Reading	130° Green
Quadrantal Error Corr.....	7°
Corrected Scale Reading	137° Green
Compass Course.	286°
Deviation	2° East
Mag. Course	288°
Variation	8° West
True Course	280°
Scale Reading ...	137° Green
	417°
Subtract	360°
True Bearing of Station	57°

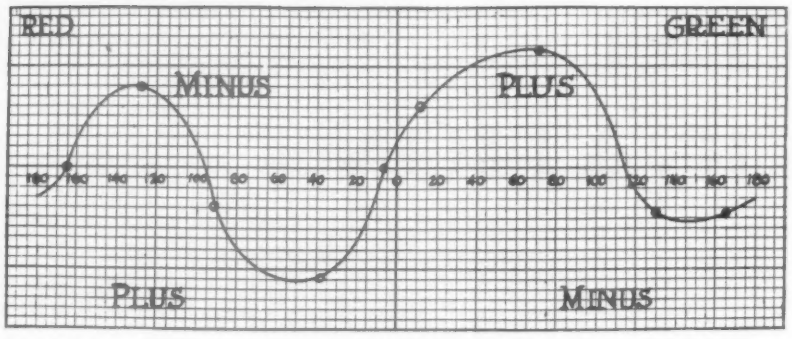


Figure 4.

N.B. Above example is taken verbatim from Manual of Air Pilotage (published by British Air Ministry). Correction of Compass Courses for Deviation and Variation was dealt with in first article of this series (March issue of AERONAUTICS).

The Fixed or Wing Coil Method which we shall consider next is specially adapted to the smaller types of aircraft and has been described in detail in a previous article. This method while of considerable value to pilots under certain circumstances is of relatively small value in obtaining position lines and is usually used in planes where no facilities for "plotting" position lines exist. As was pointed out in the December article a plane by this method can be kept always pointing towards a transmitting station but any wind unless it be directly ahead or astern will cause the plane to make a curved line of approach to the the station if navigated by this method alone.

TABLE I

The magnetic bearing of the transmitting station being known, the aircraft is placed successively on various magnetic courses and the scale reading obtained on each course is noted. By applying the scale reading to the course, the W/T bearing of the transmitting station is obtained and any quadrantal error is at once obvious. The accuracy of the correction curve depends upon careful observations and upon the number of courses upon which scale readings are taken. In the example below, readings were taken for twelve courses; if time allows a larger number is to be preferred.

Magnetic bearing of station: 143°.

Magnetic Course of Aircraft	Scale Reading	W/T Bearing of Transmitting Station	Correction to Scale Reading
63°	68° G	131°	+12
92°	42° G	132°	+11
126°	11° G	137°	+6
149°	6° R	143°	0
192°	38° R	154°	+11
241°	94° R	147°	+4
265°	50° G (130° R)	135°	−8
308°	15° G (165° R)	143°	0
343°	16° R (164° G)	147°	−4
18°	51° R (129° G)	147°	−4
56°	76° G	132°	+11

From this table the curve is plotted as shown in Figure 4.

A line of bearing may be taken by flying straight towards the transmitting station and noting the Compass reading and this reading corrected for Variation and Deviation will be the correct bearing of the station. A good course may be made good when conditions permit of drift calculation, by heading straight for the transmitting station noting the drift and then altering the course to be steered, into the wind by the amount of the drift angle. (This subject was dealt with in the first two articles of this series, March and April, 1929.) In a similar way a check can be made flying away from a radio transmitting station.

Position Lines by Radio Rotating Beacon Station

THIS method is more in use in Europe than in U. S. and the present beacons revolve once a minute so that whatever the position of the receiving aircraft a minimum signal is heard every 30 secs. Immediately the minimum beam is true north and south a "V" is signalled by Morse Code. Should the plane lie nearly north or south of the station then the "V" will be transmitted when the signals are very weak and may not be heard. To overcome this difficulty a "Q" is signalled just before the beam is directed at East. A bearing is obtained by starting a stop watch after "V" or "Q" is heard and stopping it at the first following minimum. The beam turns through 6° per second, so that if the number of seconds recorded on the stop watch be multiplied by 6° the true bearing is obtained if time was taken from "V." If "Q" was taken the bearing has reference to East and 90° must be added to it. Unless the aircraft is very close to the station no doubt should exist as to which side of the station the observer is situated. The two following examples are taken from the British Manual of Air Pilotage:

[*Continued on page 80*]

Monthly Financial Review

by

J. Allen Grover

Pynchon & Co.

IN the past month the securities markets in the United States have witnessed the most severe decline on record. Many men well versed in the country's economic and financial affairs have felt for some time that stocks were selling too high, but, on the other hand, an even number continued to voice exactly the opposite opinions. Unfortunately, the general public paid more attention to the latter prophets than they did to those who saw the future not quite so rosy and the result was that during the latter part of October, when the decline started, the public was caught comparatively unawares and a debacle ensued which finally reached panic proportions and carried stocks down to levels which appalled even the most pessimistic. Naturally in such an occurrence thousands of people, both large holders of stocks and small holders, were wiped out and paper profits, rolled up during the last four years of amazing prosperity, disappeared in a few days as though the past four years had never been.

Now that conditions have quieted somewhat and the panic among stockholders has subsided, everyone is casting about to find the reasons for this most curious of all collapses in our financial history. Other periods of extreme stress such as we have just been through have been traceable to very definite causes, such as over-expansion of the railroads which practically bankrupted the country in the last century, the scarcity of money, or the failure of some big financial house. Not one of these factors apparently was in existence in the latter part of October when the present downward movement got under way.

There are two opinions current at the present time as to what the real cause of the decline was. One is that there was an over-production of securities which was an illness within the market itself and had nothing to do with general business conditions whatsoever. There seems to be a great deal of truth in this opinion for we all know that during the past three or four years the public has been asked to absorb an enormous amount of securities which until now they have always done without causing a credit strain so severe as to hurt business. Those who hold to this theory point out that general business before the break was in excellent condition, that corporations were showing big earnings, paying good dividends and showing on their balance sheets vast surpluses of cash. The people who follow this theory are the optimists today because they feel that the disaster in the securities markets will affect those markets to a great extent, but will not make itself felt to such an extent that the business of our leading companies will be injured severely.

The other theory which has been advanced is that business has actually been declining since the late Spring of this year and that the collapse of the securities markets was caused by a general undermining of confidence in business, which indeed was not going too well. These are the pessimists at the present time who go further and point out that the decline in the securities markets has cost the people of the country so much money that it is bound to have a very depressing effect on general business and that this, added to the decline which was already under way, will result in a period of a year or more of uncertain conditions before we can expect another revival. This position is more difficult to substantiate with facts than the other, but it is one to which the writer inclines. It is true that many basic indices of business were encouraging right up to the moment of the first big break, but not all of them were. Building had suffered through high money rates, agriculture has not yet felt the benefits of the Administration Farm Relief program and while railroad carloadings held up remarkably well they have not for some time been keeping pace with production, which shows that distribution has been declining and that over-production has been an evil for some time past.

One other reason for supporting the latter theory is that the enormous loans made by the so-called "bootleg" bankers, or wealthy individuals and corporations, indicates not so much that business conditions were booming, but rather that business expansion had not been wide enough to utilize these surplus funds which were, therefore, poured into the stock market. In other words, had business been expanding as our optimists said it was, the great surpluses of corporation and wealthy individuals would have been employed in this legitimate channel rather than in the stock market which is, after all, an alien field for such funds.

The aviation industry being the newest and most spectacular in the country was the first to feel these effects of a general business decline and consequently we found the aviation securities market reaching low levels some weeks before the break came in the main securities markets. The decline in aviation securities came about through over-enthusiasm and over-production which we

[*Continued on page 88*]

THE INVESTOR

With aviation stocks changing position rapidly in an industry complicated by swift growths and rapid amalgamations, the opportunities for both wise and unwise investment are large. It is only on the basis of accurate and newest information that proper judgment of value may be achieved.

In order to service those readers who are interested in investment possibilities AERONAUTICS will secure the best available information on all current investment possibilities on request. Queries should be addressed to *Aeronautics Advisory Investment Service.*

THEY TELL US—

A Forum of Comment Criticism and Remarks

Newark, N. J., Oct. 25.—As a publicity woman rather than as a representative of a college which has recently opened a department of aeronautical engineering, I cannot resist a comment on the "Crack-ups and the Press" controversy which you have been running in AERONAUTICS.

I feel that there is only one answer to you aviation people who are taking the newspapers to task for their sensational treatment of air accidents. It is the story of how Ivy Lee, America's greatest publicist, solved a similar problem for the Pennsylvania railroad.

The Pennsylvania, among other roads, had for long complained of unfair treatment in the press. Accidents were pounced on, sensationalized, exaggerated, even falsely presented. They were treated as aviation "crashes" so often are today.

In desperation the officials appointed Ivy Lee to, as they thought, help them combat the press. But Mr. Lee knew better than that. He knew that it is rare indeed for newspapermen to concertedly league against an organization or group. Looking at it from the reporters' viewpoint, he examined the conditions.

This is what he found: Whenever an accident occurred officials all along the line systematically cooperated in keeping it as dark as they could. Reporters who inevitably, to earn their very bread, swarm to the scene of a catastrophe, were met with rudeness, distrust, silence. Every effort was made to block their work. The result has already been shown. Unable to secure news from reliable sources the editors had no choice but to accept what they could get and if that was something to make the company uncomfortable—well, as Mr. Dyson so tactfully puts it, newspapermen are only human!

This is what he did: He reversed the whole order of things, he made it an invariable rule that when an accident occurred a whole car-load of reporters should be immediately and comfortably transported to the scene where, instead of silence and opposition they were met with a willingness to expose all the facts that was frank, fearless and friendly.

The result is obvious: no railroad in the country has a more enviable reputation today.

I am not in a position to say if a similar condition exists in aviation, although Mr. Dyson's article would lead me to think so.

May I congratulate you on AERONAUTICS, which I have found to excel in a live and up-to-the-minute presentation not only of aviation but of the seldom differentiated subject, aeronautics?

VIRGINIA J. FORTINER, DIRECTOR OF PUBLICITY—NEWARK COLLEGE OF ENGINEERING

Rosebud, Montana, Oct. 24.—I have a circular from AERONAUTICS in which the subscriber is asked for help in selecting material. My own answer has been unavoidably delayed.

In order to state my case clearly I must give you some information about myself. I am an inventor. I have invented two distinct types of wings which are successes. Both types assist in making aviation safer by reducing the taking-off and landing speeds of aeroplanes. The difficulty is in marketing these inventions. I am having trouble in both marketing my inventions and in getting connections with some company which might profit a great deal through my services. I believe in all modesty that I can be of real value to any company which will take a chance on me. I am not a trained mechanic and for that reason cannot even land a small job with a company which builds aeroplanes. I have put a great deal of study into my inventions and am getting patents.

It seems that an inventor is always in hard luck. Well, I am too. I don't know how to market my ideas to the best advantage and no company seems interested in securing my services. All the aeroplane building outfits have paid engineers to handle all these jobs and a man who presumes to add anything to the art of flying is either a fool or a maniac. Haven't these companies paid engineers? They have, but I can show them something about how to fly even if I did get my ideas watching hawks and in chasing geese about the poultry yard. I got these ideas and they are good.

Here's your answer. Why not help out the inventor, the man who invented flying and is still aviation's best bet? An inventor is as much a professional as any of these fakes with Dr. in front of their names. Why not give the inventor some kind of sane rating besides a nut with a lot of wobbly wheels in his head? Give us a service whereby we can get connected up with firms where our services can be of use. Help make the world take a chance like Columbus did. Take out the misunderstanding and prejudice and distrust that folks have for an inventor. Help guide him along. We all have much to learn, but the inventor is doing his best and it's his business to make things better. Give him a break. At least publish a list of markets for inventions in aviation.

Respectfully yours,
EDWARD L. ALBRIGHT

Boston, Mass., Nov. 13.—The article entitled "Lightning" on page 31 of your November issue gives in my opinion a distinctly misleading impression as to the importance of the damage by lightning and the effectiveness of lightning protection measures. The author states that property damage due to lightning and the fires which are caused thereby amounts only to a few million dollars a year and that the loss of life due to lightning is less than five out of every million population. Our Committee on Protection Against Lightning shows that the annual property loss due to lightning in this country amounts to more than $20,000,000 a year and the casualties due to lightning amount to approximately 500 deaths and 1,300 injuries. While these losses of life and property are perhaps not so large as losses due to other causes, they are certainly worth preventing, particularly so in view of the fact that lightning rod installations have been shown by actual experience to be highly effective. Our committee estimates that the chance of lightning damage to a building which is protected by lightning rods is only one-fifty-seventh of the chance of an unrodded building under similar conditions of exposure. This ratio is based on statistics gathered in certain Western states where a large number of lightning rod installations have been made.

In considering the losses due to lightning it should be noted that in large territories particularly subject to thunderstorms as large as 50 per cent of the total number of buildings have been protected by lightning rod installations. This greatly reduces the annual loss due to lightning.

ROBERT S. MOULTON, TECHNICAL SECRETARY —NATIONAL FIRE PROTECTION ASSOCIATION

(Editor's Note: Other letters, written in the same vein, were received from Mr. C. A. Schnoebelen, president of the Hawkeye Lightning Rod Co., Cedar Rapids, Ia.; Mr. Fred Geitz, Jr., sales manager of the Miller Lightning Rod Co., St. Louis, Mo.; Mr. George C. Willard, treasurer of the Boston Lightning Rod Co., Boston, Mass.; L. F. Diddie, of L. F. Diddie Co., and Mr. H. F. Duncan, assistant to superintendent, Label Service, of the Underwriters' Laboratories, Inc., Chicago.)

Monterey, N. L., Mexico, Oct. 26.—As per your page 71 of the November issue of "AERONAUTICS" we would muchly appreciate literature, price lists, and all specifications available for the following ships: Vance, Storms, Bat, Prest Pursuit, Whitey Sport, Kitty Hawk and Butler Black Hawk.

Should there be any charges for the above literature, please to send statement.

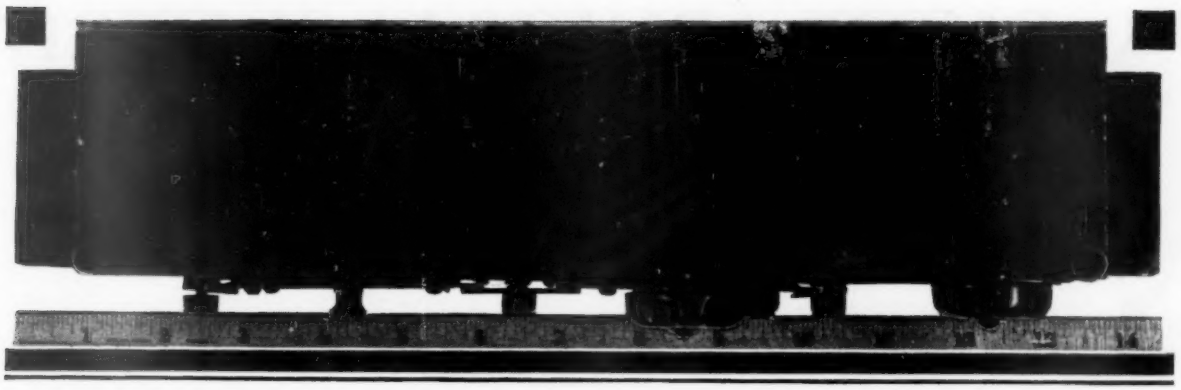
We are ardent readers of AERONAUTICS and enjoy it very much, from both the entertaining and educational standpoint. Keep up the good work.

PETE V. PETERS

Cleveland, Ohio, Nov. 22, 1929.—Received the December issue of AERONAUTICS today and must again congratulate you on putting out one of the snappiest, if not the snappiest aviation publication in the country. I have but one criticism to make and am making it because I have heard others making a similar criticism. It is

(Continued on page 85)

AERONAUTICS presents here the informal opinions of vital men, believing that in a rapidly changing industry, these are of great value in estimating the direction aviation will take. These are selected primarily for value in thought or opinion.



THE "PANCAKE" RADIO RECEIVER

by S. R. Winters

A RECEIVING set so extremely thin—only two and three-fourths inches thick—that it can be installed on the side of an airplane cockpit without interfering with the activities of the pilot or observer has been designed by the Signal Corps of the United States Army. It is a 5-tube outfit, uni-controlled, and with the three sets of interchangeable inductance coils weighs only 11½ pounds. The frequency range covered is from 250 to 1,500 kilocycles and a container carrying the sets of spare tuning coils may be mounted in the flying craft.

The circuit, while not novel, is one in which conventional arrangement is sacrificed to meet the unusual requirements of aircraft. For instance, the first vacuum tube in the set acts as a sort of coupler for the antenna and this is so arranged that irrespective of variations in the capacity or characteristics of the trailing-wire aerial this change is not imparted to the receiving set proper. A wind swinging the trailing-wire antenna does not influence the tuning of the receiver. One stage of tuned radio-frequency amplification, a regenerative detector, and two stages of transformer-coupled audio-frequency amplification complete the circuit.

The use of feed-back energy in the detector stage is effected without converting the receiver into a miniature broadcasting station. That is to say, the application of regeneration to the detector tube is not accompanied with the usual disturbing interference with neighboring radio receivers. By virtue of careful design, this so-called "pancake" receiver oscillates smoothly throughout the frequency range from 250 to 1,500 kilocycles and without electrical backlash. Furthermore, electron tubes selected for service in this stage of regeneration need not conform to certain characteristics—since, by means of a special adjustment, the detector tubes employed may vary in characteristics and yet function satisfactorily. The popularly designated "peanut" tubes are employed throughout the receiver, or type VT-5, as they are known in the United States Army.

Despite the use of a so-called coupling tube, a stage of tuned radio-frequency amplification, a specially controlled regenerative detector tube, and two stages of audio-frequency amplification, the operation of this receiver is simplicity itself—requiring the manipulation of a single dial, with quite the ease that the broadcast listener would twirl the knob of his uni-controlled receiving set. There is this distinguishing feature—the dial and other knobs on this aircraft radio receiver project only slightly from the face of the set. The knobs are beveled and the absence of projections is designed to serve the safety factor in flying. For example, if an aviator is compelled to forsake his flying craft by way of the parachute there are no outwardly extending knobs on the radio outfit to snag his clothing and thus delay his departure. This safety factor is faithfully preserved and yet the controls of the receiving set may be readily manipulated by a pilot wearing cumbersome gloves or mittens. This unusual physical outline is said to be a departure in the design of radio equipment for airplane use.

The pigmy dimensions of this new radio receiver—which the Signal Corps introduces as representing a decided advance in the radio art—may be suggested, in a feeble way at least, by comparison with similar aircraft radio receivers in the service of the War Department. The outfit which this one displaces requires two separate containers, having the following dimensions: 6½ by 6⅜ by 4⅞ inches and 15⅛ by 8⅜ by 5 inches.

The dimensions of the unit described in this article are 12 inches long, 8 inches high and 2¾ inches thick. Its overall dimensions, taking the measure of knobs, dials, mounting brackets, etc., are 14⅝ inches long, 9⅞ inches high and 3¾ inches thick. The discarded receiver, occupying two boxes, consumes 0.1167 and 0.3853 cubic feet, respectively. This nicknamed "pancake" set occupies a space of only 0.298 cubic feet. Its weight, including one set of tuning coils, is only 10 pounds, and including the three sets of interchangeable inductance coils the complete outfit weighs less than 12 pounds—11½ pounds, to be exact.

This oddly formed receiver—designed for use by the Air Corps—is mounted with sponge-rubber shock absorbers, one at either end of the set. It may be installed on an airplane in a jiffy and the container carrying the spare coils may

[*Continued on page 82*]

XUM

A BIOGRAPHICAL SKETCH

A. A. Priester

by

Helen K. Schunck

NO little of the success which has been experienced by Pan-American Airways is due to a totally unheralded man: a quiet, unassuming little person, who never intrudes, to whom one simply wouldn't turn for an opinion, unless one knew the man and his record. His name is A. A. Priester.

Priester is a man with vision; a man who gambled on the American public's acceptance of air transportation; who dared to relinquish an assured future, and take a chance in a foreign country with whose language he was only slightly familiar. But that is why he did succeed! He was absolutely convinced—long before the Lindbergh flight—that air transportation was here to stay, and that the United States, with its magnificent distances and remote international boundaries was the country which would be most beneficial by it.

Priester's belief was not due to fanaticism; it had solid foundations: a thorough training in the Dutch military service, and years with the Royal Dutch Air Lines (K-L-M), ending with his position as Assistant Flight Superintendent of the entire line. Here he saw what could be accomplished in his own native country of Holland. He helped make that network of lines a success; true, the K-L-M (as are all European airlines) was subsidized by its Government, but that did not mean an unlimited purse. (The Holland subsidy differed materially from that of the other European countries in that it did not require planes of Dutch manufacture to be used. Dutch planes were used, however, for Anthony Fokker also had vision, and he set about building the planes which experience taught the K-L-M they needed.) Unusual, isn't it, the effect these two sturdy Dutchmen, who are so unlike in practically everything, have had on America's acceptance of flying. Fokker showed us the kind of planes we wanted; and Priester taught us how to operate them.

Priester came to this country in 1925. Of course, he knew Fokker, but he was a stranger in aviation circles here. His first job was with the Stout interests, and it was in Detroit that I came to know him. We were working for Fokker over a week-end, after having flown up from Dayton; Priester was invited to the dinner given by Fokker that Saturday evening, and Fokker—in his inimitable fashion—forgot about him until the third course! Priester was a bit handicapped at that dinner,—naturally reserved as he is and so very unfamiliar with the English language, but he made a valiant attempt to grasp the gist of the conversation. Later on, he compiled some statistics for Fokker; Fokker detected an omission; Priester was dreadfully chagrined, for was not Fokker "the beeg Boss?" That quality of respect for authority seems to be so much more deeply engrained in Continentals than in Americans. Another instance of this is Priester's respect for the Eighteenth Amendment. Do you think that he would touch a drop of liquor in the United States? Indeed, not; his reply has always been—"I will not crack the law!"

Priester joined the Fokker organization in New York several months after the Detroit episode,—and you may be sure it was at a meager salary. American dollars seemed to have so much more buying power than Holland guilders! And then, too, he was laboring under the impression that he could work for a slight salary, prove his worth, and then be generously remunerated. That was one of the ideas which we (Miss Helen McCabe, Fokker's secretary at that time, and myself) tried to eradicate. (Which reminds me that long before women were seriously interested in Aviation, Miss McCabe actually sold an airplane to a customer, in fact, she handled all of the details of the sale!) We wanted him to grasp the fact that in America one's estimate of one's own worth had much to do with success or failure; that it was only good business, if one really did know one's subject outstandingly well, to value one's services and offer them on the market accordingly. I feel certain that after four years in America Priester is also an advocate of that system.

Priester's job with the Fokker organization was to outline rules and regulations for airline operation, as well as to prepare budgets for hypothetical cases and, generally, to cooperate with the Sales Department. I adored writing his reports, for they practically required translation to be understood, and Priester was learning our English with a vengeance! One of his most repeated remarks was about a flying field. He returned to the office after its inspection and said: "It iss so roof, it must be pluffed." Is there any real reason why "rough" is pronounced "ruf," while "plough" is pronounced "plau?"

When the Philadelphia Rapid Transit Company's contribution to the Sesquicentennial took the form of an airline, connecting the cities of Philadelphia, Washington and Norfolk, Mr. Mitten decided to use Fokker planes and also arranged for Fokker, personally, to have charge of the operations. Here is where Priester found his niche! He was made Assistant Flight Superintendent, and although not in direct authority, all of the operations were built up around Priester's rules and regulations. The line was a success in all but a monetary consideration. They say that the people of Philadelphia set their watches by the arrival and departure of these planes. And Priester loved it all, and gave unstintingly, and was still unknown.

The P-R-T retained his services until after the final report on the operations had been compiled,—and this report was a masterpiece. Priester is a thorough painstaking detail man, with imagination—a rare combination. I believe his greatest reward for his work here was the fact that, as he expressed it at the time, "they gave him a seat in Spruce Street" to write the report.

Shortly after this airline was discontinued, Priester again went with the Stout people, at Detroit. He remained with them until the formation of Pan-American Airways, when J. T. Trippe, who knew Priester's value and who also knew that the magnitude of their scale of operations depended materially upon the success of the initial venture, bought his services.

[*Continued on page 85*]

BRIEF NOTES FOR THE MONTH

A digest of the important information and developments of the month, compiled each issue for the busy executive with vital information classified and quickly accessible.

AIRPORTS

Consolidated Aircraft Corp. is planning one of the largest and most completely equipped privately owned airports in the East, at Tonawanda, N. Y., a short distance from the company's Buffalo plant.

Advanced Aircraft Corp., Richmond Hill, N. Y., has begun construction of an all-steel hangar, 80' x 60' at Flushing Airport for the New York City Airport, Inc.

New Jersey has $7,000,000 already invested in airports, schools and allied industries, Charles R. Dann, president of Atlantic Air Service, Inc., estimates.

Baltimore Airport, Inc., has been capitalized at $5,000,000 and proposes to build an airport occupying 125 acres of ground about two miles from the city.

Work is expected to start in the near future on the first floating landing field for use on ocean airways. Edward H. Armstrong is behind the project.

Interstate Co., pioneer airport caterers, have leased the east wing of the new station at the Curtiss-Grand Central Air Terminal, Glendale, Cal.

Abandonment of a plan to build a $300,000 state-operated airport was announced by Governor Fred W. Green of Michigan.

There are now 1,510 airports in operation and 1,234 more planned in the United States.

Seventy-three airports and one field for dirigibles are in operation in Alaska.

AIR MAIL

A new proposal to carry all first-class mail at the rate of 60 cents per 1,000 miles and 6 cents for each additional 100 miles was submitted in connection with pending applications for a transcontinental air mail service between Washington and Los Angeles. Southern Skylines, Inc., made the bid.

With a subsidy of $4,810,438, Germany leads the United States, France, Italy and Great Britain in grants to the aeronautical industry. The U. S. subsidy, in the form of air mail contracts, totals $4,508,812. France's grant is $4,512,219; Italy's $2,536,440, and Great Britain's $1,216,625.

American Airship Association, Inc., has submitted a proposal to the postoffice department to transport mail across the continent in dirigibles at a cost of $3 per pound, with 36 hour service.

Plans for extending the air mail service between Miami and points in the Windward and Leeward islands have been deferred pending a survey of appropriation needs for the current fiscal year.

Establishment of a new air mail service between St. Louis and New York is being planned by postal air mail officials, Senator Hawes of Missouri announces.

Air mail, weighing 701,625 pounds, was transported by air during October, Postmaster General Brown announces. This was 45,936 pounds more than in September.

Additional air mail facilities for South Carolina were urged by Representative John J. McSwain of Greenville before Assistant Postmaster General W. Irving Glover.

Reduction in air mail rates between the United States and Mexico has been approved by Second Assistant Postmaster General W. Irving Glover.

ARMY & NAVY

The army has successfully developed a plane that carries a bomb weighing 2 tons. The plane is a B-2 Curtiss Condor bomber, and was found to be easily maneuvered at high altitudes.

A naval department survey finds that more than half of the aviation crashes which have occurred in naval aviation during the past eight years were ascribable to the human and not the mechanical element.

A raise in pay for naval air pilots is being urged by Rear Admiral William A. Moffett, who sees the demand of commercial aviation for experienced pilots as a peril to the service force.

The budget bureau has cut $4,500,000 from the $44,000,000 allowance asked by the War Department for the air corps.

CANADA

Canada has inaugurated airmail services between Winnipeg and Calgary, via Regina, Moose Jaw and Medicine Hat, and Regina and Edmonton, via Saskatoon and North Battleford.

Alaska-Washington Airways of B.C., Ltd., has been incorporated in Canada. The company is authorized to issue 1,000 shares of no-par value stock and to engage in any branch of commercial aviation.

Canadian private air pilots now number 290, an increase of 136 since the beginning of 1929. The number of commercial pilots has increased from 193 to 280 and air engineers from 199 to 271.

The Canadian Department of National Defense has placed orders for 13 Vickers "Vedette" flying boats, to be powered with Wright J-6 motors.

Rutledge Air Service of Calgary and Commercial Airways of Edmonton have affiliated.

CHANGES

Schlee-Brock Aircraft Corp., Detroit, announce the consolidation of two international air lines and the purchase of a field for use as a terminal at Minneapolis as steps in an expansion program. The Arrowhead International Airlines and Canadian-American Airlines, Inc., were the consolidated companies.

Associated Aircraft, Inc., has transferred all its activities to Angeles Mesa and Exposition blvd. The company reports that every student enrolling for the private pilot's course is given a transport pilot's ground course.

Aero Supply Corp. is reported as one of the firms to figure in a giant merger of concerns making airplanes and supplies.

The Stinson Aircraft Corp. has completed its merger with the Cord Corp.

DISTRIBUTORS

Curtiss-Wright Flying Service is soon to establish a nation-wide chain of airplane service stations, equipped with supplies and parts for practically every standard make of airplane.

McCray Air Services of Fairview, Pa., have been appointed distributors of the Davis V-3 Monoplane in the Northwestern Pennsylvania territory.

Consolidated Instrument Co. will open a mid-Western branch in Wichita, Kans. M. E. Hulse, Western sales manager, and Prentiss Cleaves, Jr., will be in charge.

Great Northern Aviation Corp. has been appointed exclusive northwestern distributors for the B. F. Goodrich Rubber Co. aeronautical supplies.

United Aircraft Exports, Inc., has en-

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tered an agreement with Air Associates, Inc., to handle the latter's complete line in export trade.

Minnesota Monocoupe Agency has been organized to take over the distributorship of the Mono Aircraft Corp. products in that state.

Pratt & Whitney Aircraft Co. has opened an office in Los Angeles. E. B. Haines is in charge.

FOREIGN

The Argentine air mail and passenger service between Buenos Aires and Asunción, inaugurated this year, has been aided materially by a reduction of rates to a little more than twice that charged by river steamers. The plane route takes eight hours, 45 hours less than train and more than three days less than boat.

The German Federal Traffic Ministry announced the new lighted air route from Berlin to Schkeuditz, where the Halle-Leipzig airport is located, is nearly completion. The route will supplement the two lighted air lines which extend from Berlin to Koenigsberg and from Berlin to Hanover.

An airplane convertible from a land-plane to a sea-plane and which will serve as a fighter or bomber, for reconnaissance, as an ambulance for carrying passengers or for land-range travel has been produced by the Fairey Aviation Co., Ltd., of England.

The German Lufthansa is experimenting with the transmission of pictures from a Berlin radio transmitting station to airplanes in flight. A weather chart and the position of a thunderstorm were sent.

The latest German development in plane construction is the Stork, a tailless craft powered with an 8 h. p. motor. Recent tests showed the Stork can fly 78 miles per hour. Its cost is $800.

A single seater fighting plane of all steel construction has been built by The Bristol Aeroplane Co., Ltd. The plane is capable of 172 m. p. h. and will climb 31,200 feet with a full load.

Dr. Ing. E. Rumpler, head of Rumpler Ocean-Flug, of Berlin has designed a flying boat to accommodate 170 passengers and crew for trans-Atlantic service.

Warsaw and Berlin will be joined by an air service early next Spring. Both Polish and German planes will be used on a thrice-weekly service.

A saving of 24 hours in the receipt of European mail has followed the inauguration of air mail service between Cape Town and the Rand.

The Lufthansa is preparing to inaugurate regular airplane service to Oberammergau during the showing of the Passion Play next year.

Australia has decided to close down and dismantle the experimental aircraft construction plant which has been maintained at Sydney.

The Dutch Lufthansa Co. announces a European air mail route to South America to tie up with the Condor system in Brazil.

The Graf Zeppelin has been authorized to carry air mail for any destination by the German federal post ministry.

GLIDERS

The first glider camp in the United States will be opened Dec. 26 at Mt. Palomar, near San Diego. W. H. Bowlus, head of the technical training department of the Airtech School of Aviation, will be instructor.

W. H. Bowlus, president of the Bowlus Sailplane Co., established a new American record for motorless planes by remaining aloft 1 hour, 21 minutes and 9 4/5 seconds.

The Glider Club of Vancouver has been formed with 55 members.

INVENTIONS

An automatic airplane control, which will keep the plane flying on a straight line or in circles, without attention from the pilot, has been patented in Germany.

Methods of muffling airplane noise are being tested by the bureau of standards.

LEGISLATIVE

Requirements for registration of arriving and departing planes are outlined by the aeronautic branch of the commerce department. The register includes the following information: License number and model of plane; owner of plane, pilot and his license number; time of arrival and departure; number of crew; and number of passengers.

Gasoline brought into Florida and stored solely for refueling airplanes in interstate service is not subject to the state's six cent tax.

Capt. Ralph H. Wooten, air corps, U. S. Army, has taken up his duties in Santiago as military attache at the U. S. Embassy.

MISCELLANEOUS

The Navy Department has selected a design for a gold medal to be issued to the naval personnel making the first successful trans-Atlantic flight in 1919. The design consists of a seagull on the obverse and the names of the personnel on the reverse.

The board of governors of the New York Stock Exchange has approved the application of The Aviation Corp. to list 117,925 shares of the firm's stock to acquire minority interest in the Southern Air Transport, Inc.

Hotel Hussman in El Paso is working on plans for an addition to accommodate aviation officials, pilots and members of the industry. Suites for offices of air transport companies are planned.

The Daniel Guggenheim Fund for the Promotion of Aeronautics is to pass out of active existence December 31. It was declared that aviation has outgrown the need for further sponsoring.

Fifteen planes took part in San Diego's first aerial parade. Six planes from Airtech, six Ryan Flying Service ships and a formation of transport planes from local airlines took part.

An all-metal Soviet-built monoplane, commanded by Cdr. Moshkof, successfully crossed the Pamir mountains, 20,000 feet high, after three months of preparations.

Roosevelt Field, Inc., was granted authority to operate a broadcasting transmitter, using only one watt of power, from a parachute when it is descending.

Violations of air regulations have more than doubled in the past fiscal year, but have not been in proportion to the increase in the number of planes in operation.

A new Ford 14-passenger, tri-motor, all-metal monoplane has been purchased by Bell Telephone Laboratories to expand their program of aircraft communication research.

Pioneer Instrument Co.'s earth inductor compass and flight indicator are being used by the "Land of Soviets" plane. All other instruments are of Russian manufacture.

Curtiss-Wright Flying Service is nearing completion of an aerial survey of 8,481 square miles in the Mississippi Flood Control program of the government.

American Aeronautical Sales Corp. announces $1,685,582 in sales for the past year. New orders for Savoia-Marchetti planes totaled $540,200.

The low altitude air route through the California mountains used by the Graf Zeppelin has been formally named "Eckener Pass" in honor of Dr. Hugo Eckner.

The Graf Zeppelin will make a trip next April to the vicinity of the North Pole under the auspices of the Aeroarctic Society.

A Curtiss-Challenger Robin was displayed in the lobby of a theater during the showing of the motion picture "Flight."

Two "mystery" planes, products of a foreign aircraft designer, were entered in the First Annual Baltimore Aircraft Show.

Cirrus motored planes took the first four places in the Grosvenor Challenge Cup races at Newcastle, England.

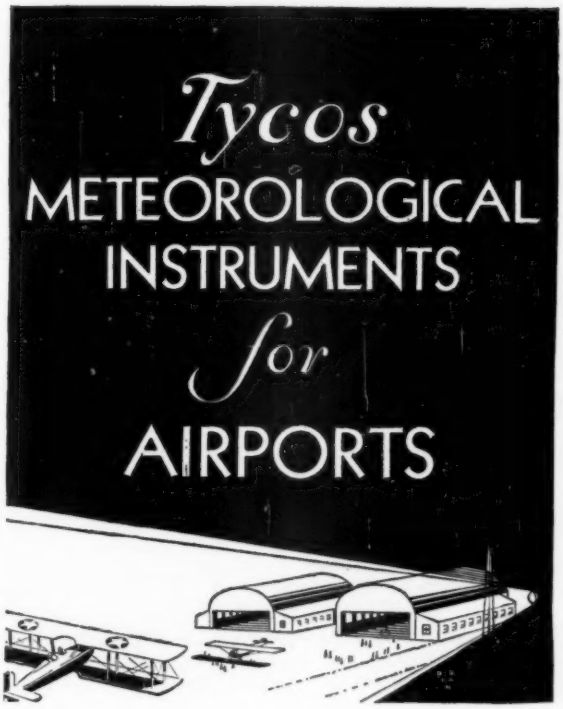
The Cleveland News has purchased a Fairchild "71" Deluxe plane to promote their aviation program.

Use of airplanes to smuggle silk into the Argentine was disclosed by the commerce department.

Plans are being made at Cincinnati for a big indoor aviation show, Feb. 8 to 15.

[Continued on page 46]

Meeting Government Requirements for Accurate Weather Knowledge



"ALL airports, whatever their size, should be prepared to furnish information about the weather."

This is a familiar statement to airport owners and managers, taken from the Department of Commerce bulletin "Notes on Airport Management" and part of an article saying that minimum information should include the wind velocity, temperature and barometric pressure. Records of humidity, maximum and minimum temperatures, and rainfall are given as desirable.

TYCOS Instruments for airports fulfill these requirements. Seventy-eight years' experience manufacturing fine instruments has given Taylor Instrument Companies an enviable reputation for high grade products. TYCOS weather instruments are used by the U. S. Weather Bureau, U. S. Navy, U. S. Army Air Corps, and leading airports. TYCOS weather instruments are made of the finest material, built by skilled mechanics, and tested and retested to insure their accuracy.

Write for our booklet, "TYCOS Meteorological Instruments for Airports," which has been prepared by our aeronautical engineers and prescribes the proper instruments for every size airport.

For pilots and airplane manufacturers is our complete catalog of TYCOS Instruments for Aviation. Write for a copy.

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BRIEF NOTES FOR THE MONTH

[*Continued from page 44*]

PERSONALS

John William Geppert has completed the "A" course of the bureau of navigation, Navy Department, graduating with a grade of 91 per cent. He was the first officer in the Naval Reserve to complete the Navigation Course "B." Mr. Geppert is supervisor of the advance navigation course of Universal Aviation Schools.

Ernest W. Dichman, army air corps engineer, has been appointed chief engineer of the Fairchild Airplane Mfg. Corp. Lieut. Dichman succeeds Ralph G. Lockwood, who has been selected by the Aviation Corp. as assistant operations director.

Walter Beech, president of the Travel Air Airplane Co., has been made president of the Curtiss-Wright Sales Corp. in charge of sales of commercial planes, and vice-president and director of the Curtiss Corp.

R. S. Clary, aeronautic branch of the commerce department, recently predicted that private flying will play an important part in lowering cost and increasing the production of airplanes.

Dr. Walter M. Cross, consulting chemist, testified in U. S. District courts in both Kansas City and St. Louis on the same day recently, using his Lockheed monoplane to keep the engagements.

Frank M. Rainey recently became affiliated with the Cessna Aircraft Co. For some time, Mr. Rainey was with the William H. Rankin Advertising Co. and with Deere & Co. of Moline.

Gilbert G. Budwig has been appointed director of licensing and inspection of the aeronautics branch of the Department of Commerce and Harry H. Blee, director of aeronautic development.

F. Trubee Davison, assistant secretary of war, declared that there are now more than 1,000 square miles of developed or projected airports in this country.

Ellis Clyde Work, Jr. has been appointed project engineer for the Spartan Aircraft Co. Neal M. Harrison and Charles E. Feltner were added as layout designers.

Tom Keene, 80 years old, has been elected president of the West Side Flying Club, Taft, Cal. Mr. Keene has been flying ten years.

John Guglielmetti, coast pilot, recently flew from Los Angeles to Oakland in a new Emsco Cirrus with a gasoline bill of $4.14.

R. C. Gazley is aiding H. J. Stoneburner in designing two new planes which will be added to the 1930 line of American Eagles.

Daniel Guggenheim sees the "next advance" in aviation is to be "export minded," an editorial in the New York Times declares.

Lieut. Ralph Stanton Barnaby, construction corps, U. S. N., and Mrs. Hattie Meyers Junkin were married Oct. 31 in Washington.

Curtiss-Wright Flying Service has appointed Earl Raymond Southee as manager of operations of Columbia, S. C.

C. F. Van Sicklen has resigned as vice-president and director of sales for Great Lakes Aircraft Corp.

John B. Morrow has been appointed comptroller for Pickwick Latin American Airways at Mexico City.

A. E. McManus has been appointed assistant to the president of the St. Louis Aircraft Corp.

Betty Huyler has been appointed airplane saleswoman by Curtiss-Wright Flying Service.

PRODUCTION

Tests show the new solo sport pursuit biplane of the Wichita Airplane Mfg. Co. has a top speed of 115 m. p. h. with a landing rate of 35 m .p. h. A plywood covering on tapered wings is an innovation. The plane is powered with a 60 h. p. LeBlond motor.

The new Fleetster, an eight place cabin monoplane, had its first trial flight at Buffalo. The plane was designed to have a cruising speed of 180 m. p. h.

Six planes of different types are now being marketed by the Curtiss Aeroplane and Motor Co. These range from the Robin to the 18-passenger Condor transport.

Five air lines are now using ice warning indicators, manufactured by the aviation division of the Moto Meter Gauge & Equipment Corp.

The new addition to the Mohawk line was granted approved type certificate No. 263 by the commerce department.

The new B-7 Ryan Brougham has been given an approved type certificate by the Department of Commerce.

Fleet Aircraft, Inc., announce the sale of 245 open cockpit training planes since Feb. 13.

SCHOOLS

Curtiss-Wright Flying Service has let contracts for steel equipment for the new warehouse, salesroom and ground school, being established at 1918 Washington blvd., St. Louis. Contracts will soon be let for equipment for new hangars under construction at the new Curtiss-Steinberg Airport.

Parks Air College has extended to students of the limited commercial pilots' course the new combination plan under which transport pilot students may buy training and a new airplane at a reduction over separate purchases.

William A. Winston, national director of flying in the Curtiss-Wright schools, is inspecting the company's flying service units in the Middle West. The Pacific coast and southern units will be inspected next.

Roger Inman has been added to the flying staff of the Spartan School of Aeronautics. R. Todd Crutchfield and Howard G. Estes have been added to the sales force of the Spartan Aircraft Co.

The Roosevelt Aviation School has been given the Department of Commerce certificate for complete aviation training, including the course for a transport pilot's license.

George Gruen has been appointed chief instruction pilot of Parks Air College. Mr. Gruen takes the place of Clyde E. Brayton, who becomes assistant to Oliver L. Parks.

Airtech School of Aviation has opened its first branch training school at Palm Springs, Cal. Airtech will construct an airport approximately 2,600 feet long.

Lawrence Eck, 12 years old, is reported the youngest regularly enrolled aviation student in America. He is taking the ground school course at Airtech.

Students numbering 475 have been graduated from Parks Air College School for Airplane and Engine Mechanics since the opening of the school a year ago.

Parks Air College advanced students are flying nightly from 8 o'clock to midnight in line with the specification of the commerce department.

Erwin F. Skoodopole and James C. Shultz, transport pilots, have been added to the staff of the Flo School of Flying.

Roosevelt Aviation College has inaugurated classes at 119 W. 57th St., New York.

TRANSPORT

While Germany led the nations of the world with 111,000 passengers carried by air in 1928, the United States piled up the greatest mileage with 10,472,000. Germany flew 6,303,150 miles and the United States carried 53,000 passengers. France flew 21,000 passengers 4,666,137 miles and Britain 29,500 for 1,135,000 miles during 1928.

Northwest Airways have inaugurated a tie-up between Minneapolis and the Twentieth Century at Chicago. The airways' plane will leave the twin cities at 8:45 a. m., arriving in Chicago at 12:25 p. m., making connections with the Century at the Englewood station at 12:50.

Aero Corp. of California's newest trimotor Fokker-10 is outfitted with an electric stove, electric hair curling irons, electric refrigerator, radio, bookcase, typewriter, desk, card table, chaise longue and seven roomy seats for passengers. The plane cost $100,000.

[*Continued on page 66*]

CESSNA ANNOUNCES

The Most IMPORTANT MESSAGE OF THE YEAR

Beginning January 1, 1930, the Cessna Aircraft Company will no longer be affiliated in any way with any sales corporation within the industry. On that date, with a new sales policy, a new sales organization and with new models, the Cessna Company sets forth to gain its rightful place as a leader in the aeronautical world.

At no other time in its entire history has the Cessna Aircraft Company faced such a promising future. Financially sound, led by men with wide experience in every phase of the aeronautical industry, the new organization has every reason to be confident of success.

As for the planes themselves . . . . In stability, strength, speed, fuel economy, ease of handling—in all of the requirements modern aircraft must meet—the new Monoplanes Cessna, each with an Approved Type Certificate, are excelled by none in their class. They have a definite, permanent place in the aeronautical world; they are built to meet a rapidly growing demand for planes of their type throughout the field of aviation. We prophesy that the new Monoplanes Cessna will find instant acceptance wherever their performance is noted.

DISTRIBUTORS

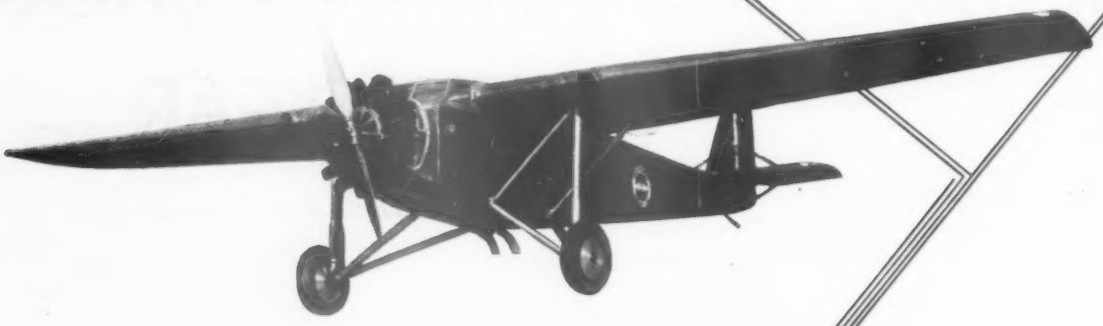
Territories are being filled rapidly, due to the exceptional value of the Cessna Sales Franchise. Reliable business men are requested to write immediately for complete information.

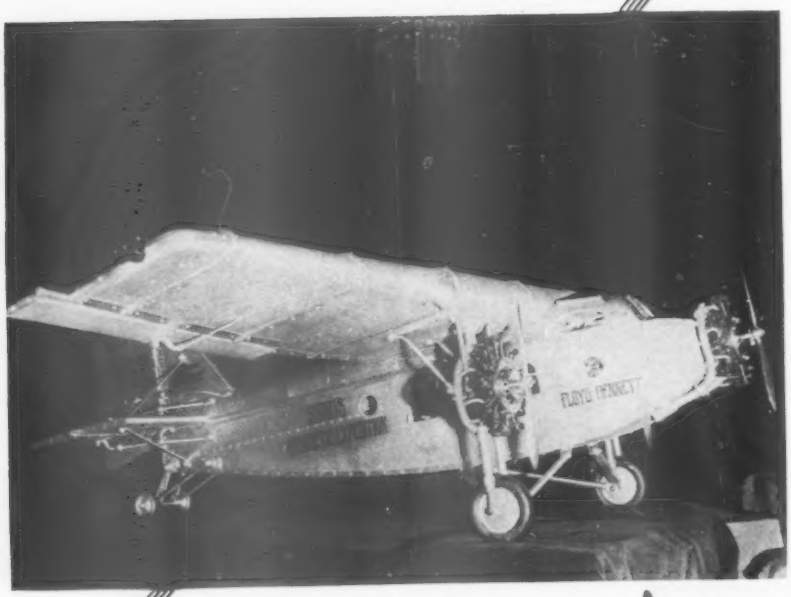
CESSNA AIRCRAFT CO.

WICHITA ✤ U. S. A.

THREE MODELS

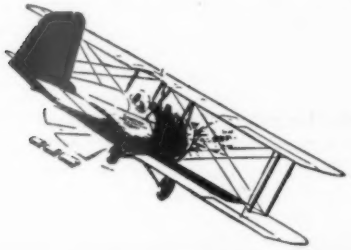
These three beautiful models made exactly to scale, are part of the off-hour work of A. P. Nelson pilot for Northwest Airways.

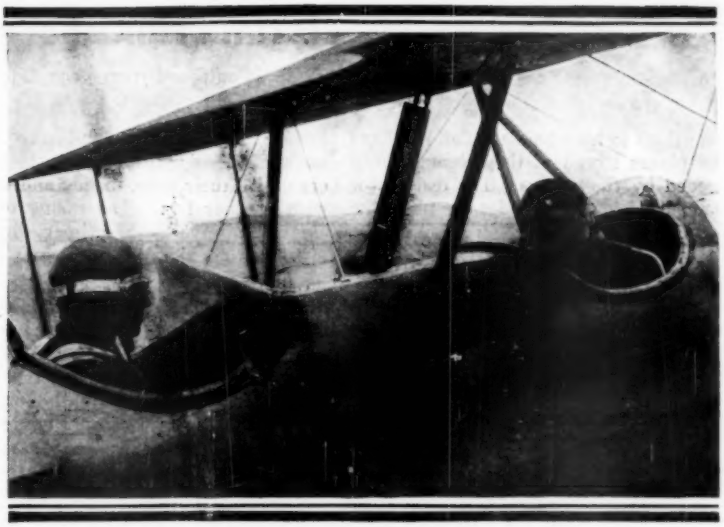




SPARTAN

A FULL-FLEDGED UNIVERSITY OF THE AIR





An advanced flying class receiving instruction in parachute operation

Motor instruction includes practical work on all modern motor types

A thoroughly equipped Spartan welding school graduates expert welders

. . . QUALIFIED TO PREPARE YOUNG AMERICA FOR ITS FUTURE IN AVIATION

CREATING the one positive safeguard for those who ride, buy or learn to operate an airplane, the United States Government has established inflexible rules of qualification for transport pilots, transport planes . . and for schools of aviation. Many pilots and many planes . . but few schools . . have passed this exacting test.

The Spartan School of Aeronautics, approved by the U. S. Department of Commerce as both Transport Flying and Ground School, meets every Government requirement and all instructors are Government-licensed.

To student pilots Spartan offers three other major advantages: 1—Spartan training planes operate from the Tulsa Municipal Airport which twice in 1929 reported business exceeding that for the same period at the Croydon, England, airdrome. 2—Winters in Tulsa are short, normally mild and the majority of days are clear. 3—Spartan students have access to the factory of Spartan Aircraft Company for study of modern airplane production methods.

COURSES—Spartan offers three courses qualifying graduates for license examinations in the following grades: Private, Limited Commercial or Transport Pilot. Each course includes technical, theoretical and business subjects.

Two other special courses qualify graduates as expert Mechanics or Welders.

EMPLOYMENT SERVICE—Spartan operates an employment service for students. Openings are investigated and expert assistance is given the qualified graduate in making a professional connection.

FREE AIR TRANSPORTATION—Southwest Air Fast Express operates tri-motored Ford planes to Tulsa from St. Louis, Kansas City and Springfield, Missouri; Oklahoma City, Oklahoma; Dallas, Fort Worth, Wichita Falls and Sweetwater, Texas. Spartan will pay the air fare to Tulsa from any of these cities for those enrolling in the Transport or Limited Commercial course, or half the air fare for those enrolling in the Private Pilot or Mechanic's course.

SPARTAN SCHOOL OF AERONAUTICS

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DISTRIBUTION PROBLEMS

[*Continued from page 21*]

quantities to his wholesalers and to have the planes stored at these centers until needed by the dealers. The distributor is required to pay cash for the planes he buys from the factory.

In no legal sense is there any agency arrangement between the distributor and the manufacturer, yet the supervision and control exercised over the distributor is unknown in any other industry except the automobile industry where the exact conditions prevail. Factory policies govern every business move of the distributors and dealers in the conduct of their business, in selling, servicing, prices, the stocking of replacement parts, etc. The extent of this dictatorship depends upon the degree of popularity that the planes or automobiles that the manufacturer sells has with the public.

The coverage of a large amount of territory by a single representative is oftimes impossible and is unsatisfactory to the factory. The distributors are expected to sub-divide their territory into districts and to appoint dealers with exclusive territory rights within these districts. The automobile industry has found that its strength roots in the legitimate dealer. It may be possible for the wholesaler to be eliminated from the distributing system but the dealer is an absolute necessity. The success of every aircraft manufacturer will rest fundamentally on the efficiency and ability of its dealer organization.

When the automobile industry was yet in its infancy, and the manufacturers were building up their dealer organizations, the logical persons they turned to were the bicycle dealers, hardware dealers, locksmiths and electricians because these people were able to give the mechanical service necessary to car buyers. Airplane manufacturers are making direct efforts to enlist automobile dealers as being the most logical persons to turn to in building up their own dealer organizations. Automobile dealers would appear to be, by training, knowledge and experience in selling transportation, the logical men to "carry on" with this new transportation medium.

Car dealers know sales psychology and have the proper merchandising background. They are being offered broad territories at a very small investment, usually through the purchase of only one demonstration plane. As they are already established with display rooms, sales organizations and service departments, the adding of an airplane franchise appears to many of them a golden opportunity to get in on the ground floor in aviation at practically small expense to themselves. It is doubtful, however, if the two dealer lines dovetail together. Automobile manufacturers are not sympathetic about having their dealers divide their time, money and energy with another line. The selling of new cars will always be the primary business of the automobile dealer.

The real successful dealers, these days, are the ones who work indefatigably day in and day out developing their car sales force and in selling cars. Selling and servicing two kinds of merchandise, where before all time and effort was needed to take care of only one, means that neither will be properly taken care of. The airplane dealer of the future will deal exclusively in airplanes and not sell it as a side line.

Mr. Alfred P. Sloan, Jr., president of the General Motors Corporation, has stated that "the weakest part of the automobile industry today is the position of the retail dealer." The aircraft industry can profit by the mistakes of its older sister industry and eliminate many of the unsound practices that have been brought about by competitive situations in the automobile field. It is better to adopt corrective measures now in the factory-dealer relationship than to wait until it becomes a cancer gnawing at the insides of the industry.

The dealer problem which has been allowed to develop in the automobile industry to an unhealthy state, must be met promptly and decisively in the aircraft industry. Any policies which injure the dealer unfairly or inadvertently draw a penalty on the manufacturer. The manufacturer's blind faith in volume at any price bears down constantly on the dealer. The ever increasing pressure by the factory and the distributor for sales and yet greater sales in order that the manufacturer can continue with his increased production requires a more liberal policy as it affects the dealer.

The manufacturers hold a bayonet at the backs of their dealers with the threat of cancellation of franchises if they do not adhere to factory schedules. Unsound selling practices by the dealers result from such procedure and affect the manufacturer and the industry adversely. A liberal policy by the industry with respect to forcing dealers to sell beyond their capacities, is vitally necessary.

Sound business principles must govern factory-dealer relationship and unsavory practices are not conducive to closer ties. Manufacturers should not interfere too much with the dealer's individual control of his own business as such a practice is resented by dealers. A friendly human factory organization should "select and appoint representatives of sufficient net worth and sound common sense to a definite territory; to provide planes in proper quantities that are competitive in performance, appearance and price; at a discount which will ensure a suitable return on capital invested and energy expended; to support him with the necessary national advertising, reduce his service problems to a minimum and generally to operate on as few, fair and stable policies as possible."

The manufacturer should inquire carefully into the credit standing and operating efficiency of the distributors and dealers who handle his planes. He should make sure that those who profess willingness to handle his line intend to build up a business for permanence and not merely as a popular fad. He should look carefully into the moral character of the dealer, his past record and reputation, business and personal, in his former field of business and the manner in which he takes care of his obligations. Capital should be adequate but this is not absolutely necessary. He should refuse to have any business relations with a dealer whose record is not clean.

In the automobile field there are many cases where dealers who have proven themselves to be absolutely dishonest and unreliable with one manufacturer have been able to secure a contract with another manufacturer with little or no trouble. The aircraft manufacturer cannot afford to put his merchandising system in the hands of such men. Due to very keen competition, to the necessity for representation in certain districts and their desire to increase production, producers may be tempted to overlook such defects, but it will react on them in the long run.

Such men are not interested in building for permanence and before long the manufacturer will face an exceptionally high mortality rate in his distributing organization.

The retail dealer is the center figure of importance in the aircraft industry and it cannot be stressed too strongly that those producers who do not build a strong dealers' organization now, will either be pushed to the wall or else struggle along endeavoring with indifferent success to keep pace with the procession.

The problem of sales and distribution is one which is paramount among aviation leaders today. Its solution will be a large factor in the ultimate growth of the industry. Aeronautics will continue to present authoritative articles on this subject.

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ALL THE WORLD'S A MARKET PLACE

[*Continued from page 16*]

Going to town formerly involved taking a vacation of not less than a month.

To travel from Lima to Iquitos presents a greater problem than a trip to Moscow. Dr. Herbert Adam Gibbons in his "New Map of South America" suggests a route by way of Valparaiso across the continent to Buenos Aires then up the Atlantic coast to Rio de Janeiro. By this time the man who would go to Iquitos has been on the road three weeks and still has before him a twenty-five hundred mile voyage up the Amazon. He would actually save time by going by way of Europe.

From Lima to Iquitos in a straight line is 600 miles, but to get there by the usual route involves traveling a third of the distance around the world and involves dangers more grave than the real or imagined dangers of flying.

Naturally, none would care to undertake to fly this trip in a plane of doubtful performance as there are very few places on the route that could be utilized for a forced landing and in case of fog the only thing to do is to climb rapidly to an altitude of fifteen thousand feet and stay there as long as the fog lasts.

There are mountain peaks in this country towering fifteen thousand feet above the sea level, some few are even higher—seventeen thousand feet. It goes without saying that here is the world's worst flying country, but in spite of this fact, it is being flown every day. Airplanes are being constantly improved; they have already reached such a point of efficiency that travelers in mountainous South America are willing to concede that it is safer to fly than to struggle over the mountains along narrow paths or to row up the tropical rivers.

These mountainous countries of Northern and Central South America are rich in resources. Geologists and economists declare that Bolivia for example is capable of supporting as great a population as France. The resources are there. The climate is not at all bad. Bolivia could and would be a world power "IF" it had transportation.

The situation in Bolivia is almost unbelievable. For example some of the finest oranges in the world are grown there, but they are grown so far from the city markets that the cost of getting the fruit to the consumer in this land-of-no-roads, is greater than its value. California oranges travel more than three thousand miles and are consumed by Bolivians who have fruit of equal quality in their own country.

Vast forests of hardwood are worthless because it is impractical to transport lumber several hundred miles on the backs of mules or in canoes. The same is true of vast deposits of copper and tin. Poverty stricken Bolivia is immensely rich and lacks only the means for tapping her wealth.

Peru to a lesser degree is like Bolivia. It was the wealth of Peru that made possible the Spanish Empire. After many years of struggling with natural and political obstacles the Peruvians have builded a few railroads. The building of these involved engineering skill of the highest order and the spending of enormous sums of money.

It is estimated that the construction of a railroad from Lima to Loreto, just over the border in Colombia, would cost more than the present total wealth of Peru. At the same time it is agreed that such a program would make a very small dent in the potential wealth. The solution is obviously the conversion of potential into actual wealth.

Colombia, like her neighbors, is badly handicapped because of her transportation troubles. She has large deposits of coal and iron but they, with a few exceptions, are in isolated sections—sections not reached by any modern means of transportation. It is not possible to transport these bulky commodities great distances on the backs of mules or in airplanes.

Planes are being used with great profit by miners of gold, silver and precious stones. It is, of course, cheaper to fly a consignment of precious metals than to send it mule-back under heavy guard.

Colombia has one of the best commerical air lines, called the Colombian-German Society of Aerial Transport. The society provides rapid, reliable and cheap transportation. It enjoys the respect and even the affection of the Colombians—furthermore it pays handsome dividends.

It has been suggested by several eminent Colombians that further construction of railroads be postponed until it can be determined whether or not the airplane can solve the transport problem. Men whose enthusiasm exceeds their knowledge predict that the airplane is the solution to the perplexing problem that has so long vexed most of South America.

Pious Colombians and Peruvians have called the airplane God's gift to South America and, on account of this gift, foresee for their countries a deliverance from isolation and a tool for the development of vast resources.

The airplane is not the solution, *per se*, but can and doubtless will make possible the true solution. The real wealth of these countries is in metals and minerals and foodstuffs of the staple kinds.

The engineers are agreed that the airplane is limited as to loading per horse power. It will probably never be possible to transport coal, oil, wheat, beef, etc., by plane at a cost sufficiently low to permit of a profit. Trainload quantities of coal, beef on the hoof, wheat, etc., cannot be handled by airplanes at this time nor at any future time unless the impossible happens. Airplanes are not competing with locomotives, but are co-operating with them. Aviation will not supplant railroads, but will assist them in many ways. The two have much in common, especially in frontier countries.

The builder of railroads uses a plane or planes to get men and tools to the place where they are needed and at the time they are neded. Flying has simplified the problems of the engineer in a country where these problems have long been acute.

The United States of Colombia will not postpone the building of railroads because aircraft is being employed. On the contrary the reverse is true. The more planes they have the sooner they will get the much needed railroads.

A means of transportation is also a means for the communication of ideas. Colombians are traveling more extensively in their own country since the advent of flying. The result is a better understanding of their problems and the solution of these problems.

The coffee planters have enjoyed a period of great prosperity. The world has become a convert to the milder coffees. These are grown in Colombia. The price has recently advanced sharply—hence prosperity in the Colombian foothills and, as a result of this prosperity, travel and leisure for a large and important class of agriculturists and as a result of this travel and leisure, a better understanding of a common problem.

The planter knows that it costs him as much to send his coffee to market—to tide-water as it does to grow it. He must in many cases send the coffee to the sea-port or rail-head on the backs of mules. A five-ton truck could do the work of two hundred pack mules. A pack mule carrying a hundred and fifty pounds will travel thirty miles in a day under the most favorable conditions. A truck could travel two hundred miles in a day carrying five tons. That is, the truck furnishes in one day the same amount of transportation that sixty-odd mules would furnish in a week.

Of course, it is much cheaper to ship by truck, but this method requires roads so the planter must depend on his mules until the roads shall have been built. He must also feed these mules grass and grain that ought to be used in the production of food animals. The economic waste is tremendous and affects the con-

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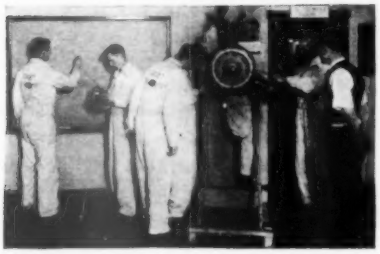

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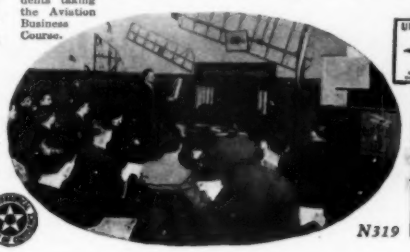

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sumers of meat and grain all over the world.

A great many coffee planters own planes. They fly to Bogota or to other cities and discuss their problems with their fellows and with government officials. One planter believes that he can move his coffee to market as cheaply by plane as by the old method. He estimates the cost of transporting his coffee from the ranch to Barranquilla at about nine cents a pound—a conservative estimate. One of the larger planes capable of handling a pay load of a ton or more can surely carry a pound three hundred miles for nine cents.

The planter believes a plane in this case would show a profit even if it were used for no other purpose than to take the coffee to market. Perhaps the airplane will prove the solution of the planter's problem, but the miner or potential miner, cattle men, etc., still lack means of transportation for their products and are going to demand highways or railroads or both. The coming of the airplane will not retard but will hasten the building of needed roads in Colombia.

The story of the development of aviation in Colombia is one of the most fascinating and remarkable tales ever told. Colombia is the most thoroughly air-minded country in the world. This is natural enough when it is considered that aviation has added so much to the wealth and comfort of these enterprising citizens of New Granada.

The fight for concessions and monopolies in Colombia has resulted in plots and counter-plots in the capitals of Europe and the United States of North America. There is a vast fortune awaiting the concern that succeeds in gaining any real advantage in Colombia.

Colombia has money—plenty of money. The recently developed oil fields have enriched the government and many citizens. The price of Colombian coffee remains high and the demand steady. Coffee growing is the chief agricultural industry. Oil is the greasy Santa Claus that has already reduced the national debt to the vanishing point and is expected to create a handsome surplus in the very near future.

Here is a country perfectly adapted to travel by air—that being the quickest and cheapest means for getting across the mountain to the next town. The people are sold on air travel and a great many of them have the money to buy planes.

The prosperity of Colombia furnishes much food for thought. If this country is prosperous with half her resources still inaccessible, what will it be when the treasure-house is unlocked? Here is a country whose population might be doubled in the next few years and whose per capita wealth could at the same time be the highest of any country in the world. Here is a market for airplanes—a better market than the richer and more populous United States of North America.

We North Americans fly to save time, or for pleasure. The South Americans fly for the same reasons and other better reasons; for example, to save money and to safeguard health. The navigation of tropical rivers is not a healthy business. It is also slow and expensive. The Colombian who flies from the coast to the interior, avoids the malaria belt, saves days of his time and considerable money.

American makers of aircraft are very likely to dominate the Colombian market and the markets of all the Latin American nations, but it is taking them a long time to get started. There are American made planes all over South America, but not as many as there should be. These planes are proving their meddle. The Yankees are also proving that they are able to offer more planes for the money than their European competitors.

North American farm machinery and automobiles have long since proved their worth. European competitors declare that the machine-made mass production harvesters, automobiles, and airplanes will not stand up as well as those made more or less by hand. If there is any superiority in handwork it has never been proved to the South American buyer of machinery.

Europe needs markets, but it's no good wasting sympathy on her. In fact, the best friend of the European manufacturer is his most active Yankee competitor. Europe must get away from wasteful old-fashioned methods.

It's good for all concerned to explode the myth that a screw made on the old style hand machine is better than one made on an automatic and, being better, should command a higher price.

The amount of "handwork," that is, work down with old fashioned equipment, on an airplane powerplant does not make it a better plant in any respect, but a few South Americans have accepted the notion that the so-called handwork is superior and has a right to command a higher price.

The same situation existed when and where the American automobile competed with those made in Europe. The Yankees made good because they couldn't help it. They offered a lot more transportation for the money and so won the market.

The same thing is likely to happen—is happening—in a small way in aviation. Big business in the United States has taken to the air. We read nearly every day of combines and mergers. This means mass production at a low cost. It also means that the manufacturer of planes must have markets—bigger and better markets—in all parts of the world. South America is keenly interested in the progress of aviation in the land of the Yankees. The people of the Southern Republics are looking to the day when huge factories will turn out airplanes in large numbers and at a small cost. The genius of Yankee engineers is expected to produce flivvers of the air, reliable craft within the reach of the average purse.

The hoped for flivver is coming, but it will not be a real flivver. Planes that might perform very satisfactorily at sea level would hardly do in a country where the flyer must take off at eight thousand feet above sea level and in case of bad flying weather must climb rapidly to fifteen thousand feet.

Obviously, such conditions indicate a plane with plenty of power and even with mass production such a plane must command a price in keeping with the service it will be called upon to render.

South America is potentially richer than North America. The next few years will witness a great migration, from Europe and North America to the Latin-American republics. The migration has already begun—and is on the increase. In the absence of roads, airplanes will be used more and more in the work of exploiting and developing a mighty continent.

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In his next article, Mr. Allison will discuss ways and means of establishing an aircraft sales organization in South America.

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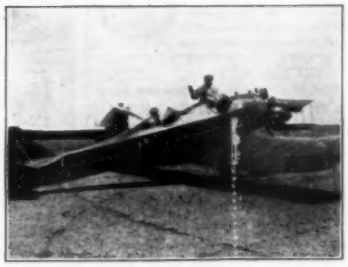

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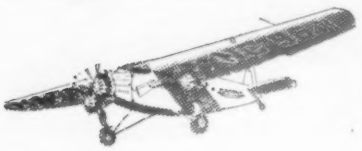

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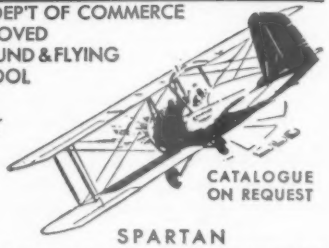

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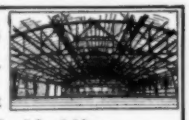
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AIRCRAFT OF THE FUTURE

[*Continued from page 14*]

condition that confronted us was keeping the lubricating oil sufficiently warm to prevent its getting too thick to use in the engine. When we had water as a means of cooling the engines, we used to have to drain it all out and blow out all the tubes, gasoline and others, because water condensed inside them at low temperatures and got into the carburetor. With non-freezing cooling liquids that do not thicken up at low temperatures, that trouble is eliminated. We still have to heat our oil but we may get away from this some time.

Difficulties were encountered in priming engines properly so as to get explosions in the cylinders, but the use of very volatile liquids, such as ether, helped a great deal.

It is much more inconvenient, dangerous and unnecessary for an airplane engine to be without a self-starter than is the case with an automobile. The weight of these devices is not excessive and the comfort and safety derived from them is tremendous. Cranking an airplane propeller by hand is a dangerous and laborious process, especially when one is alone. I used to fly a single seater airplane a great deal and frequently made forced landings. I have often barely escaped being hit by the propeller after starting the engine because the airplane would jump over the logs or stones I had put on the ground to hold the wheels. Finally, a trick I learned from Major Ocker solved the problem for me —I would tie the tailskid of the plane to a fence or tree, and post a farmer there to cut the rope with a knife when I was ready to take off. A self-starter would have eliminated all these difficulties. Many a good man has been killed or seriously maimed for want of this one thing.

Let us consider what is required to keep an airplane flying in fog or storm. Night flying we may dismiss because it is practically as easy as day flying, in many ways easier. Air conditions at night are usually better than in the daytime and if lights are visible, they form an even better guide for direction than landmarks in the daytime. When we get into a fog or storm, however, with heavier-than-air craft, we lose all sense of equilibrium, we don't know whether we are going up or coming down. We may get over on our side or even upside down and we cannot tell where the horizon should be. It is just as though we were inside a sphere painted all the same color. Our primary consideration must be to keep the ship flying on an even keel and then to give it the direction we wish to take. Devices have already been perfected which will accomplish our purpose, such as the gyroscope. This instrument is like a top, when you spin it rapidly enough it will assume a position and keep it.

All the navies of the world are now equipped with gyroscopic compasses. These are set to point north and hold their position as long as their speed of rotation is maintained. Many commercial vessels are equipped with what is called the "Iron Quartermaster," a gyroscope which takes hold of the steering gear and guides the ship on its course. When one of the great liners passes Fire Island Lightship on its way to Liverpool, the course is set on the gyroscope and the ship turned over to it, which guides it with unerring accuracy. Hitched up to the master gyroscope may also be a gyroscope which prevents excessive rolling.

In an airplane, the gyroscope can be used in a similar manner. The gyroscopic pilot may be set to take the plane off the ground, and when it rises to a certain altitude, assume the desired direction and fly straight toward its destination. The only compensation that must be made is for the effect of the wind, and this can be done by radio telegraph if no other means of identification and position are available. With the automatic pilot, if a plane runs into a storm or fog, the controls can be turned over to this device which will take it safely through. All large ships should be equipped with it. Many years ago the Sperry Gyroscope Company of New York had this equipment well on the way to perfection.

The problem of finding an airdrome in a fog was solved long ago by the radio direction finder, and another device which will keep the airplane over the airdrome. These are no longer in an experimental stage. The radio may be used also for obtaining weather reports and for conversing with ground stations or other airplanes. Modern radio equipment is not heavy and not so expensive as it used to be.

Now that we can construct landing gear that will allow an airplane to drop vertically a certain distance without injury, our next problem to consider is telling where the ground is when the plane has arrived within 30 feet of it. In the past, this has been almost impossible in a fog or heavy storm, and constituted a great danger to air navigation. The instruments previously used to determine one's altitude depended on measuring the height of the column of air upward, but to get satisfactory results we must measure the air under us. Electrical altimeters are now almost perfected which will enable us to tell within ten feet of the distance the ground is from us. They will not indicate whether a high tower or church steeple, a building or individual peak of a mountain is in our path, but such things can be avoided by maintaining a safe altitude until over the airport and then coming down in safe spirals.

Another serious menace to air navigation is the formation of ice on the wings and controls of a machine. This coating of ice not only weights the airplane down but also changes the shape of the control surfaces and body so that the plane becomes unmanageable. This can be overcome in a number of ways, but as yet no single one has been successfully applied under all conditions. Every airplane that flies long distances during cold periods should be equipped with some means of preventing frost from forming on the wings.

Lack of space prevents my going into greater detail about the numbers of types of airplanes necessary for specific kinds of work. A large airplane built as I have indicated will easily give us speeds of from two hundred to three hundred miles an hour, and should carry passengers from New York to San Francisco in twelve hours. Such ships could also fly across the Atlantic or to Asia, or cover the seven seas. Naturally, airplanes equipped with all these devices will be very expensive at first, and manufacturers hesitate to try anything like this on account of the cost. They would have been built long ago by the government service had not the Navy Department, principally, stopped our development of aviation in the United States.

For civil air transport in time of peace, lighter-than-air craft, or airships, offer many advantages over heavier-than-air craft, or airplanes, particularly for passenger traffic across the North Atlantic, where the fog menace is very great. The straight line distance from land to land, that is, from America to Ireland, is about 1,900 miles; but to go by way of Greenland, Iceland and the Orkney Islands, where the shortest water jumps are, necessitates a trip of almost twice that distance.

Airplanes would be preferable for a trip from New York to Peking, because they can go straight to Alaska behind the barrier of the Rocky Mountains which shuts off fog from the Pacific, and behind the Siberian curtain of mountains in Asia. The only water jump is across Bering Strait which is 52 miles wide. However, to the Oceanic islands in the Pacific, such as Hawaii, the South Sea Islands and Australia, the airship again presents great advantages.

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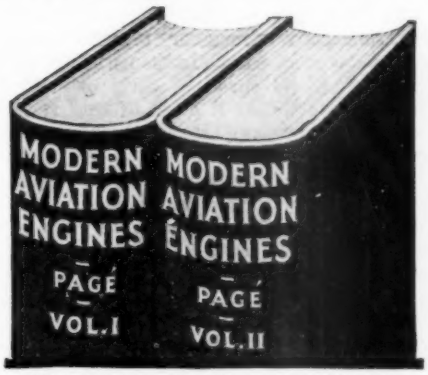

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in the air without the use of motive power, it has many of the same characteristics that a ship on the water has. The disadvantage heretofore has been that it was such a large, unwieldy structure, hard to handle, and difficult to construct sufficiently strong or fast to "buck" the average storm. In the north, ice formed on the envelope and propellers so as to weight it down or cut its envelope to pieces. However, the Zeppelin Company of Germany have already overcome most of these difficulties. The ship that they recently sent around the world is merely a little laboratory model of what can be made in the future. I had the privilege of going over this ship carefully with Dr. Eckener while it was being built at Friedrichshafen. It contains a great many interesting features which are a distinct advance over previous types. They have not been brought out before by the Zeppelin Company because until recently Germany was prohibited from building airships, by the Versailles Treaty.

One very interesting thing is that the Graf Zeppelin uses a gas of the same specific gravity as the air for fuel for its engines. When this gas is consumed, air takes its place and the specific gravity or weight of the airship is not affected. The older airships used gasoline for motor fuel, and a great deal of lifting gas had to be put into the ship to lift the total weight of ship and fuel. As the gasoline was used up, the airship would rise in the air, the lifting gas would expand, particularly in the heat of the day, and some of it would have to be valved out and lost. At night when the air became cool, the lifting gas would contract, the airship descend, and ballast would have to be thrown overboard. This not only cut down the radius of travel, but necessitated a very complicated system of ballast along the keel in order to keep the ship in proper trim. The success of the great voyage of the Graf Zeppelin around the world was primarily due to the use of this fuel.

Airships are thus enabled to fill their lifting gas bags only partially full of hydrogen, helium or whatever lifting gas is used. They know approximately the temperatures they will run into on any given trip and the altitudes at which they will navigate. They put sufficient gas into the ballonets so that none will be lost by expansion. Consequently no gas has to be valved and the only loss is the little leakage which always occurs through the fabric of the bags, just as there is a small leak of water into vessels on the sea.

The Graf Zeppelin has greatly improved the strength of its envelope by making two keels instead of one, by reinforcing its various frames and by the use of a new metal in its structure, electron, which is lighter than duralumin. One of the deficiencies of this ship is its shape, it is too long for its cubical contents; in other words, too much cigar-shaped instead of egg-shaped. A long ship cannot be made strong enough in the middle and when it gets into serious storms such as line squalls, where the air is going up in one place and immediately adjacent to that is going down at great speed. This is apt to tear the ship in two, as was the case with the Shenandoah.

The reason the Graf Zeppelin was not made more egg-shaped was from motives of economy. The hangars of the Zeppelin Company at Friedrichshafen, which are long and narrow, were not torn down as they were supposed to be in accordance with provisions of the Versailles Treaty. Instead of incurring the additional expense of putting up taller hangars, the Germans built this experimental ship in the ones they already had. The next ship will be much thicker in proportion to its length.

The Graf Zeppelin is deficient in speed. It can only make about seventy miles an hour in still air. Aircraft must make 100 miles an hour or more in still air in order to be able to buck storms adequately. This is unquestionably possible with an airship, as much more efficient engines, propellers and means of building them have been devised.

In the next few years we may confidently expect to see rigid airships of the Zeppelin type, capable of a cruising speed of over 100 miles an hour and a top speed of 15 or 20 miles more, strong enough to withstand any storms encountered and thoroughly equipped for carrying 50 to 100 passengers and 100 tons of freight.

The prospects are that airship travel will be the most comfortable and pleasant of any. There is no dirt or dust such as accompanies railway travel, no spray and not as much motion as in ships on the water. The engines can be made noiseless and the vibration throughout the ship reduced to a minimum. The temperature of the cabins can be regulated by heating and plenty of room afforded to walk around and exercise. The air is the greatest cushion known and as aircraft is surrounded by it, there is a constant shock absorber or spring all around the structure.

The airship can be equipped with engines that will carry it clear around the world on one charge of fuel. The Zeppelin Foundation is now experimenting with heavy oil engines of the Diesel type, which depend on the heat of compression to explode the fuel injected into the cylinders. Heretofore it has been impossible to make them as light as is necessary for aircraft use, as the walls of the cylinders have to be very thick and strong to resist the pressure used. Different fuels have been tried, and the pressure reduced from 500 pounds to 250 pounds per square inch with good results, at low altitudes. But at high altitudes where the atmosphere is cooler, this has not proved satisfactory and the aircraft Diesel engine is still a matter of experimentation.

Weather conditions play a very important part in airship travel. In the northern hemisphere, the prevailing winds are from west to east, and they are stronger in the north than in the south. The shortest distance from the United States to Europe is in the north, that is, from New York to London or Paris. Airships will use this course so as to benefit from a following wind. On the trip from Europe to America, however, they will take a course by way of the Azores, Bermuda and our south Atlantic coast. The first large airship stations for trans-Atlantic travel will probably be in the vicinity of Chesapeake Bay, as this area is an intermediate point between the strong easterly air currents of the north, and the more gentle ones of the south.

Airship ports are in a state of development. The Germans prefer them arranged with hangars radiating out like the spokes of a wheel. In this way an airship always may be brought in head to the wind, tied up to a track on the ground and pulled right into a hangar. For launching it head to the wind, it can be taken into the hub of the wheel and turned in any direction and then taken out of the appropriate hangar.

Mooring masts to which the airship may be tied up in the way a vessel on the water is tied to a buoy have also had some application, but are not particularly satisfactory except in comparatively calm weather, because the waves of air moving along the ground get under the ship and whip it up and down.

Still another method of mooring the ship which has many advantages is to have a large cradle on the ground into which the airship settles and is pulled down and secured firmly. This cradle is so arranged that it can be shifted around in order to keep the ship always head to the wind. When airships are built of metal so as to better resist the action of the weather, this sort of mooring will be economical and practical.

Some day we shall undoubtedly see airship stations with the hangars arranged radially from a center, and the whole structure roofed over so that airplanes may land on it. This airport will be alongside deep water, where waterborne commerce can be handled. Railways will run underneath the structure and roads for motor trucks and automobiles will come in at the ground level. In this way a complete transportation terminal would be effected.

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or by anti-aircraft fire during the war, in spite of the fact that they could not go very high then and were very deficient in speed. An airship makes an excellent airplane carrier, far superior to any seacraft because it not only has greater speed, maneuverability and radius of action, but also is able to launch all its airplanes at once, a whole squadron of 24 planes, if desired. On the seacraft airplane carrier only two or three airplanes at most can be launched simultaneously; usually only one at a time. In fact, seacraft carriers are practically a thing of the past as far as efficiency in war is concerned, and are hardly worth considering. Until airplanes are perfected to the point where they can fly across oceans alone and unaided, the airship affords a great opportunity to transport airplanes or air torpedoes across the Atlantic or Pacific.

Just after the war, the Army Air Service tried to get a Zeppelin to develop as an airplane carrier, but as usual these efforts were thwarted by the Navy, who later obtained for themselves the ship we wanted, the ZR-3, now called the Los Angeles. Since getting it, the Navy has done nothing in the development of airship transport, and as a result America has been forced to follow Germany.

In time of peace, the ability to land airplanes on airships could be utilized for delivering passengers, freight or mail to the airship as it passed over cities or surface vessels, without requiring it to stop.

A type of aircraft deserving a great deal of attention is the helicopter, or heavier-than-air craft designed to rise straight up from a position on the ground. Contrivances of this kind have great advantages in landing on restricted spaces, such as small fields or the tops of buildings. Since the advent of the very powerful gasoline engine, it has not been a difficult matter to make a structure that will ascend vertically. The difficulty has been to make it sufficiently stable so it would not swing around and turn over, also to make it go from one place to another in horizontal flight. One danger has been that if anything happened to the helicopter in the air, it could not glide to earth in the way an airplane does. Also, its pilot would have trouble jumping out of it in a parachute. All these difficulties are being overcome and there are quite successful helicopters in operation at the present time which do away with practically all the disadvantages mentioned above. All of them have propellers for pulling or pushing themselves off the ground and up into the air, and then an arrangement for inclining these propellers, or using others, to pull them in horizontal flight. These same propellers in some instances act as parachutes and stop the speed of fall in case the engine cuts out. The pilot is also placed in such position that he can get out in a parachute.

The cost of development of this form of aircraft has been very great. Governments have only done a small amount of experimentation, but there are several good types being worked on by their inventors and promoters. In the next decade, I am confident that a great deal will be done with them. They will make it possible for a business man to go up to the roof of his office building, get into a helicopter and fly to an airport or fly up and meet an airship or airplane going overhead, bound for Europe or Asia.

There is no apparent limit to what we can do in the air. If we had a department of aeronautics with a cabinet member at its head, it could take up these matters and push them through successfully. At present, the enormous amount of money appropriated for aeronautics in the United States is more than one-third wasted on account of the duplication of effort between the various departments that handle aviation and their inefficiency and ignorance of the subject.

SAILBOATS OF THE AIR [*Continued from page 27*]

dioed to his factory while he was on an ocean liner. His first passenger flight lasted 13 minutes. The record for time flown with a passenger was held by the school teacher, the late Ferdinand Schulz, who also held the endurance record for single-place gliders. He and his passenger remained aloft nearly 9½ hours. Schulz was killed while flying a motored plane not long ago.

Simple gliding—the kind first tried and that which the student who aspires to travel through the air without the aid of a motor first must learn—is simply sliding down hill in the air, just like coasting down an inclined surface on a wagon, sled or skiis.

There are special types of gliders intended for just such coasting, but not for sustained flights. These are designated as primary and secondary training gliders. The first is the simpler. It is ruggedly built, has an open lattice-work fuselage, and the pilot's seat is not enclosed. The square-tipped wings have a span of about 32 feet. The aspect ratio —that is, the wing length divided by its breadth—is in the neighborhood of 7. Standard airplane controls are used. The secondary type glider is similar to the primary, except that it has an enclosed cockpit and is a little more airworthy. Both types usually are monoplanes.

The common way of launching gliders is by means of rubber airplane shock cord. This is an elastic rubber rope 50 to 100 feet long, with a ring at its center. The ring is placed over an open hook at the forward end of the glider fuselage. Eight or ten men, divided into two groups, take hold of the rubber rope ends and draw it out into a V position, with the apex at the glider hook. Another group holds the tail structure or a rope at the rear of the glider, to keep it from moving while the rubber rope is being stretched.

A German glider in flight.

At the command, "ready, walk," given by the pilot or coach, the rope crew walks ahead ten paces, stretching the rope. At the word "run," the two groups run ten more paces, and at the command "turn loose," those at the glider tail release their hold, and the glider is catapulted into the air, like a stone from a slingshot, the shock cord dropping off.

The pilot is strapped into his seat so that he will not fall or be thrown out. If he happens to land in a way that could not be called skillful, he may receive a little jolting, but he will not be injured seriously because of the absence of a surrounding cockpit. Beginners seldom are launched in a wind whose velocity is more than 15 miles per hour, and, of course, the launching takes place from the side or crest of a gentle hill. Inexperienced flyers not infrequently break a few wing ribs or other parts of the glider, or strain a few wires. Then it is up to everyone in the glider group to lend his assistance in repairing the damage. It is in anticipation of such minor crack-ups that primary training gliders are built ruggedly, and are not intended to be flown more than ten or fifteen feet above the ground.

Soaring is considerably different from simple gliding. To master this art, the student has to do more than exchange his training ship for one more highly refined. He should receive instruction

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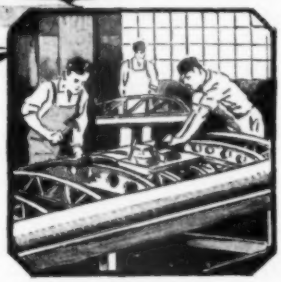

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under a competent trainer, and must master considerable meteorology if he is to be successful to any great extent.

A glider intended for the making of soaring flights is often called a sailplane. The reason is obvious, for the flying of such an aircraft has quite a bit in common with the manipulating of a sailboat on the water.

Sailplanes have high aspect ratios, the most refined of them having a wing whose length is 25 times as great as its width. Such a craft represents the highest attainment of the building art, and many are better designed and built than a commercial motored plane. Streamlining is important. Length of the fuselage is comparatively small. Cost of a first-class sailplane, factory built, is from $1,000 to $2,000; a primary training glider, $350 to $600, and a secondary training type, $700 to $900.

Any flight in a motored airplane is terminated by a glide—the craft sliding down the air to the ground level without using the pull of the propeller. In soaring flight with a sailplane, the object is not merely to glide downward, but to glide level or actually to rise to a higher altitude while gliding downward. This may sound impossible, but the secret lies in the fact that, in "static" soaring, the process consists simply of gliding down in a rising current of air. Obviously, when the upward effective speed component of the air current is greater than the lowest rate of descent of the glider, the machine will be carried upward.

Where do such vertical currents occur?

It has been found that one of the best places is the side of a hill. The wind, rushing across a level area, suddenly strikes upward-sloping ground. It cannot go through the hill, so it is deflected up, often rising in a current, vertical or nearly so, one or two times as high as the hill. Air blowing in off the sea or other large body of water will, upon striking the shore, even though the land is not much higher than the water, be deflected upward. Such apparently insignificant factor as the change in the nature of the ground surface will give rise to upward currents, as in the case of wind blowing across a field and encountering a forest edge.

Therefore, the sailplane pilot has only to find these upgoing air currents. Then, by gliding downhill in one of them he actually gains altitude. But it requires considerable study and practice before one becomes proficient in picking out places where upward currents are probable, hence the necessity of a knowledge of meteorology.

When he comes to the edge of a vertical current in which he has been flying, the flyer will start to lose altitude. He must, therefore, seek to enter another upward current or to return to the one he just left. Continued success leads to such endurance records as that established by Ferdinand Schulz.

Gliding in vertical currents created by up-slope winds alone is not always possible in cross-country flying. At first, distance flights were made by climbing to as high an altitude as possible, and then taking a flat glide with the wind. Distance covered depended largely upon the gliding angle of the machine, that is, the ratio of the horizontal distance traveled to the vertical drop in still air. Gradually the fine points of picking up altitude were worked out. Among others, Herr A. Martens proved that sand dunes provide excellent surfaces above which to soar. He traveled 15 miles along the coast from Rossiten and then returned to his base, simply by utilizing upward currents caused by the dunes.

Every cumulus cloud, those huge, white cotton-like masses that are frequently seen rising in great billows, is at the top of a vertical current of air. Variations in temperature cause these currents, the air rising above a hot area and falling above a cold one.

For a number of years glider enthusiasts reasoned that it ought to be possible to fly into one of these vertical air streams, be carried upward while gliding through it, and then to seek another current for further gain in altitude. But the business of cloud-hopping, as the method later was named, was realized to be a dangerous one. Then, during the 1926 Rhön meet, Herr M. Kegel, a German pilot, was caught in a thunderstorm. Other contestants, seeing it approach, landed, but Kegel boldly headed into it. He soon was out of sight. He let himself be carried up for 4,000 feet, eventually heading leeward out of the storm and beating it to a safe landing. His experience with the storm was an active one. He was bounced about as if his sailplane had been a dead leaf. Some of the time he was in total darkness, and rain and hail hammered at his frail craft.

Later, other flyers indulged in cloud-hopping. They found that, to get the utmost lift, it is necessary to fly quite close to the mass of water vapor. In this position the glider is sucked up, often into the midst of the cloud. The pilot must be alert, for cloud formations change rapidly, and he may find himself outside the lifting current.

Glider activities in America are of fairly recent date. Outside of the efforts of the Wright brothers and Chanute, practically no gliding was done until after the World War. The Massachusetts Institute of Technology did some pioneer work, and even sent some pilots to European meets. In 1928 the Motorless Aviation Club of New York, and J. C. Penny brought a number of German pilots to America. Flights were made at Cape Cod, and stimulated interest throughout the country. Early the same year, Edward S. Evans, Detroit capitalist and sportsman, formed the Evans Glider Clubs of America which, at the beginning of 1929, became the National Glider Association. The result is that glider clubs are active in many of the cities of America. The formation of gliding schools and the organizing of glider-manufacturing companies indicates that the sport is here to stay.

Gliding is considerably more than a first-class sport. It is a means of training future airplane pilots. In a true sense, a man traveling in a motored plane is not flying any more than a passenger on an ocean liner is swimming. But when the man seats himself in a soaring glider and rides the air currents, he is approaching more nearly than in any other way the flight of the hawk, eagle, buzzard or other soaring bird. His machine is but an extension of himself, and he must fly it accordingly. A veteran airplane pilot does not always make a good glider operator. However, a glider pilot can be made into an excellent airplane pilot.

Gliders undoubtedly will influence future airplane design. In order to take full advantage of air currents, a sailplane must represent the utmost in design. The true, high-performance light plane, popular in Europe but not yet common in America, is but a motorized glider.

Gliding offers a fertile field to the experimenter. In Germany all kinds of novel planes have been tried. Gliders without tails or with the tail in front have been flown. Wing-tip brakes for sailplanes have been used. The research institute in the Rhön mountains has experimented with rocket-propelled gliders.

If you want to hear a veteran's opinion of gliding, listen to Dr. Wolfgang Klemperer, holder of German glider license No. 1, and now a foremost worker in American glider activities:

"It is an unrivaled sport. I am unable to describe by words the sublime pleasure one experiences in gliding over hills and valleys, silently, like the eagle, cruising or hovering, rising or descending at will. The ample controllability makes you feel like them, master of the air. The constant alertness watching for favorable air currents and studying their relations to the varied scenery below provides thrill and challenge. A few weeks in a glider camp is outdoor life in the word's fullest meaning. Soaring flight requires also a certain amount of scientific training, engineering sense and physical skill. Thus it most perfectly blends all the elements requisite for a recreational and educational sport such as the rising generation so appreciates."

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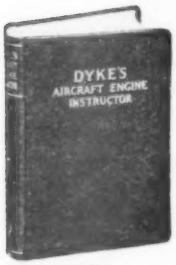

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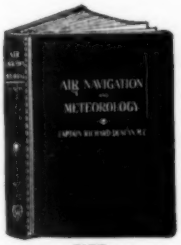

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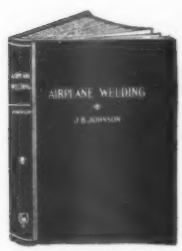

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EXAMINING NAVAL FLYERS

[*Continued from page 32*]

parachutes must be worn, well-selected goggles assure unobstructed vision, ear protectors shut out the excessive noise from the motors, and surrounding fuselage surfaces are well padded to minimize the danger of skull fractures, or less serious injuries. For the higher altitude flights, oxygen breathing equipments are supplied, as few men can continue nose breathing above fifteen thousand feet and must resort to an increased rate of mouth breathing to assist the compensatory physiological changes. More and more the early predominate thought of the mechanical efficiency of the plane is being transferred to the conservation of the pilot.

The flying line of the Navy is interchangeable from land to sea. Wheels and pontoons are readily changed for the types of duty desired. During the past two years aircraft have operated with the fleet in the West Indies, Panama, Hawaii and Australia. Additional facilities may be acquired with camps established ashore containing field hangars, repair shops and dispensaries. Here aviation medicine expands to include camp hygiene and sanitation, and aboard ship also covers every phase of preventive medicine. Expeditions increase the pilots' strain with the rapid changes from temperate to tropical climates and operating over unfamiliar and very hazardous terrain. The planes require extra care and more rigid inspections, depending on ships and mobile shops for upkeep and repairs.

Too much praise cannot be given the enlisted personnel who are the backbone of aviation. They receive special training in an aviation mechanics' school simulating the officers' ground school, becoming thoroughly familiar in construction, repairs and radio. Upon them largely depend the mechanical efficiency of the plane and no weather or other circumstances are too adverse to dampen their zeal and enthusiasm when an engine needs replacing or other repairs demand their services. Each plane has its flying crew and many enlisted men who show unusual dependence are given air instruction and become excellent pilots. A remarkable esprit de corps exists between the officers and men and in every accident the first thought is of the other fellow.

The airplane carrier has widely extended the operations of aircraft with the fleet and the huge flying decks of the *Saratoga* and *Lexington* have further facilitated the simulating of shore landing conditions at sea. The pioneer deck landing training has been intensively carried on aboard the *Langley* at sea and to date no loss of life has occurred. It is a strange sight to witness land planes darting about in mid-ocean, serving as the eyes of the fleet and safely returning to the flying deck. During the search for the lost west coast Hawaiian seaplane, many thousands of miles were flown without a single accident.

Airplane accidents and crashes are carefully analyzed and from each a lesson is sought. Each defective factor is recorded in its respective per cent column to further stimulate the eradication of danger elements. The hazards of operation include bad landings, spins, side slips, collisions in air, taxiing, weather conditions, glassy water, fire, gasoline exhaustion, bad take-offs, skidding and poor pilotage in general. Structural failures include pontoon, landing gear, rib and hull. Arresting gear and catapults further add to the operating problems. The hazards of operations have been increased the past year due to a wider geographical distribution of activities with increased difficulties of plane upkeep, yet the number of crashes due to pilots have shown a substantial decrease and the percentage from all causes a remarkable decrease per flights and flying hours.

Pilotage, now as during the war, still remains the leading primary cause of all crashes, but a 50 per cent improvement during the past six years stands as a convincing endorsement of the value of aviation medicine. This new branch of preventive medicine has unlimited possibilities and is destined to play an increasing role of importance contributing to a safer aviation.

The extensive employment of aircraft in civilian activities brings the medical aspects to the door of each physician who can perform a valuable service for the pilot after appreciating the unusual demands made upon him and the "physically fit plus" factors required. May we all be ever ready to apply the professional wrench to the weakening or wearing organism, serving the pilot as "guide, philosopher and friend."

BRIEF NOTES OF THE MONTH

[*Continued from page 46*]

A weekly air mail service between Buenos Aires and New York, via the west coast of South America, has been inaugurated by the Pan American-Grace Airways, Inc. The first plane started Oct. 12. The route is 4,500 miles long.

Transcontinental Air Transport and the Panama Pacific Steamship Co. joined their services to produce the "over and around America" trip of 9,000 miles in 16 days. The service was started Nov. 2.

Illinois Central railroad and Continental Air Service, Inc., have reached an agreement for an air-rail passenger service between Chicago and New Orleans. Twenty hour service will be maintained.

Weather observers have been established along three new mail routes, the Weather Bureau announced. The routes are Portland to Pasco, Pasco to Spokane and Omaha to St. Louis.

Universal Aviation Corp. and Western Air Express jointly will inaugurate a daily 36 hour coast-to-coast passenger air service, between New York and Los Angeles.

Boeing System has applied for permission to erect 22 radio-phone stations in nine states on its transcontinental and Pacific coast air mail, express and passenger routes.

The Chicago, South Shore and South Bend railroad has inaugurated air-rail service for its passengers to cities of the northwest, west and southwest in cooperation with the Northwest Airways and Universal Airlines.

Universal Aviation Corp. has inaugurated a system of service ribbons for its pilots, different color combinations denoting different lengths of service.

Scenic Airways has made arrangements to fly R. L. Bayless, Arizona game warden, over Kaibab forest to inspect range and winter prospects for deer.

Boeing Air Transport has just signed a contract with Austin & Co. for a complete lighting system for the United Aircraft & Transport Corp. airport at Burbank.

Southwest Air Fast Express has established a daily air passenger service to the resort section around St. James, Mo., from St. Louis.

Scenic Airways, Inc., has been authorized to establish a regular airplane passenger service between Fredonia and Nogales.

Inter-Island Airways Service, Ltd., has inaugurated air service between the islands of the Hawaiian group.

Continental Air Services, Inc., has completed arrangements to use the Parks Air College field at St. Louis on the Chicago-New Orleans route.

Columbus, O., and Havana, Cuba, will be joined by an air service of the Seaboard Airways, Inc., Jan. 1.

Southern Air Transport, Inc., is now offering a 10 per cent reduction for round trip rates over the regular one-way fare.

CHECK OVER THESE FEATURES

They are scheduled for inclusion in early issues

●

Training a Future Market, by Leroy C. Perkins, Sales Director of Lincoln Aircraft Co.

Developing the Private Owner, by William S. Brock.

Aviation in Hawaii, by E. Percy Noel.

Arrangements for Establishing a South American Sales Organization, by Z. M. Allison.

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AERODYNAMICS

[*Continued from page 36*]

11. At the wing itself, the tip vortices evidently produce or induce a downward velocity. If this velocity is compounded with the horizontal velocity of forward motion, the resultant velocity of the air striking the wing is downward. Since the lift is always at right angles to the resultant wind, the lift on the wing is now not quite vertical. As in Fig. 16, a certain part of the lift is now acting backwards, and producing drag.

This drag is termed the induced drag of the wing.

The greater the lift coefficient at which a wing is working, the greater is the tip vortex effect, and the down wash at the wing. Since at the same time the lift force is greater, it follows that the induced drag is proportional to the square of the lift coefficient.

Again the greater the aspect ratio, the less is the effect of the tip vortices.

These considerations can be put into one concise equation

$$Kx_i = \frac{125\ K_y^2}{A.\ R.}$$

whose Kx_i = coefficient of induced drag
K_y = lift coefficient
A. R. = aspect ratio.

If a wing is of infinite length, the center line of circulation also extends to infinity and there are no end losses, no tip vortices, no downward velocity at the wing and no induced drag.

A wing of infinite span has no induced drag therefore.

A wing of infinite span will nevertheless have a drag (mainly due to skin friction or rubbing of the air over its surface) which is termed profile drag. Since this profile drag is dependent on skin friction alone, it will not be affected by the lift coefficient nor by the aspect ratio, and will be substantially constant at all angles of incidence.

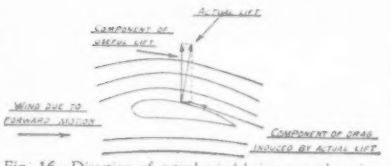


Fig. 16—Direction of actual wind being a combination of wind due to forward motion and downward velocity due to vortices.

We can now write

$$Kx = \text{induced drag profile drag.} = Kx_i + Kx_r = \frac{125\ K_y^2}{A.\ R.} + Kx_r.$$

Aspect Ratio Effects in the Light of the Vortex Theory

Our reader may have found all this discussion of vortex theory very abstract and somewhat difficult. He will be rewarded by the light which the theory throws on the practical aerodynamics of the airplane. For example, the vortex theory explains adequately the effects of aspect ratio, the ratio of span to chord, of the wing on its aerodynamic properties.

With increased aspect ratio the induced drag $\frac{125\ K_y^2}{A.\ R.}$ will decrease for a given lift coefficient.

Of two wings with a given profile, but different aspect ratios, the wing with greater aspect ratio will therefore be more efficient.

If a wing is working at a low value of K_y, the induced drag is small, and the aspect ratio is of little importance. Hence for a racing machine, low aspect ratio may be employed without hurting the top speed.

When cruising or climb is important, then we must have efficiency at a fairly high value of the K_y or lift coefficient. Therefore we must keep down the induced drag $\frac{125\ K_y^2}{A.\ R.}$ and employ a large aspect ratio.

Again if the aspect ratio is high, the downwash at the center of the wing is smaller than for a wing of low aspect ratio working at the same angle of incidence. Therefore for the same angle of incidence, the lift of the high aspect ratio wing should be higher than the lift of the low aspect ratio wing. As we have stated in a previous article, that is why tail surfaces of large aspect ratio are advantageous.

In Fig. 17, we have plotted curves of lift against angle of incidence for the same wing with different aspect ratios, and in Fig. 18, curves of lift over drag, both for a typical wing section and both derived from wind-tunnel experiments. It can be seen that experimentation fully confirms our theory.

Example: The L/D of the Clark Y is 20 at 0 degrees incidence for aspect ratio 6 and the K_y at this incidence is .0010. What is the induced drag coefficient? What is the profile drag coefficient?

The induced drag is given by the formula

$$\frac{125\ K_y^2}{A.\ R.} = \frac{125\ (.0010)^2}{6} = .000208.$$

$$\text{The drag coefficient} = \frac{K_y}{L/D} = \frac{.0010}{20} = .0005.$$

Therefore the profile drag = .0005 — .000208 = .000292 which is slightly less than the minimum drag of .000035.

Example: What will be the L/D of the Clark Y wing at K_y = .0010 for an aspect ratio of 9?

The profile drag coefficient is .000292, as calculated in the previous example.

The induced drag coefficient is

$$\frac{125\ K_y^2}{A.\ R.} = \frac{125\ (.0010)^2}{9} = .000139.$$

The total drag coefficient = .000292 + .000139 = .000431

and the L/D is now $\frac{.00100}{.000431} = 23.2$ as compared with the 20 for aspect ratio 6.

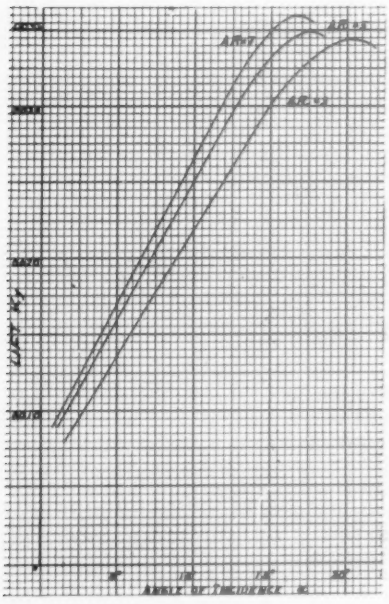


Fig. 17—Variation of lift curves with aspect ratio.

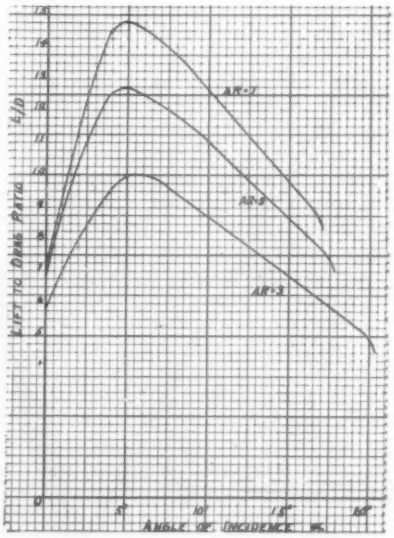
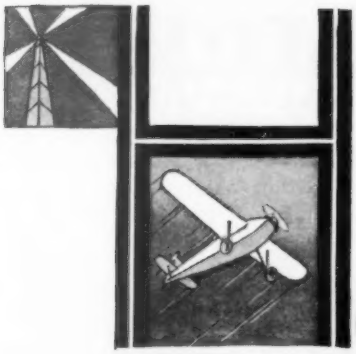


Fig. 18—Variation of lift to drag ratio with aspect ratio.



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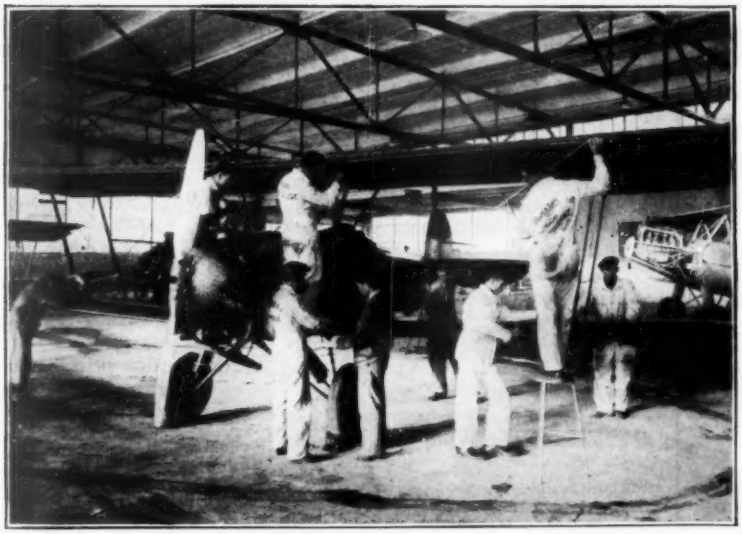

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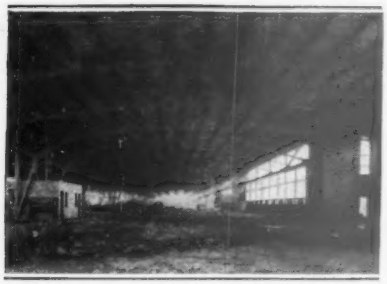

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WOMEN'S ACTIVITIES

EDITED BY LADY MARY HEATH

Mrs. Anna S. Peck, lecturer, explorer and writer, is leaving for Barranquilla, to fly over the mountains. A little while ago she climbed Mount Huescaroa, the highest point in this hemisphere.

Miss Mary Daly is attempting a parachute drop of 30,000 feet from a machine in Chicago. Bonda Strolaiski has, with a similar bravery, stunted on a moving machine above Roosevelt Field.

Miss Margaret Ludlow is one of the few United States women actively engaged in the sale of aircraft.

Miss Anna May Wong, the Japanese plucky woman actress, tried in vain to undertake the World Cruise on the Graf Zeppelin, but the great honor passed her by.

Miss Nancy Hopkins has followed Miss Haviland's example of being an airport hostess. She has taken on the largest New York Airport. We hear fine tales of her sound flying.

Mrs. Claire Mae Fahy has been accorded the honor of being the first woman admitted to the Aviation Branch of the American Legion. She took a recent prominent part in the Women's Transcontinental Air Derby.

Helen W. Sellers has recently achieved a pilot's license and hopes to teach aviation. Mrs. Robert W. Nelson of Hallowell has also achieved her commercial license.

Marthe Belle Jacobson of Indianapolis—only a stenographer some time ago—is now assistant to Elmer P. Davis of the Embry Riddle Flying School.

The Aerial Hitch Hikers have achieved their goal, and Mr. and Mrs. Zacharoff have won their way clear across the continent.

Miss Sale Barker in England, winner of the Reid Reaction Apparatus Test, went solo on her seven hours. On her first solo she both looped and spun. Lady Bailey was one of the judges chosen in this contest.

Miss Spooner in a Moth was at first categorically placed second in the 6,000 miles French Race round Europe, but later classification brought her to fourth place on account of her flying over prohibited areas.

Mrs. J. Don Alexander has been elected Colorado's Governor of the National Women's Aeronautical Association. She is busy holding meetings in her town to form a club there. Mrs. Anthony F. Joseph, Vice-President of Colorado Airways, Inc., has just been appointed Director of the Colorado Department of the Association.

Miss Arveta Rogner, who recently jumped in New York from 22,000 ft., failed to have her parachute open for several thousand feet. Her pluck in disentangling her foot from the pull cord finally saved her, but her mother had fainted with fear.

The loss of Miss Edyth Rose, Portland aviatrix, and second pilot of a large photographic machine, occurred the last week in October. It is being very deeply felt.

Mrs. Hall, publicity director of the National Women's Aeronautic Association, has just completed a campaign for her association in doing an air tour of over 4,000 miles with 15 important stops.

On the first day of November, Mlle. de Lourdes, Portugal's only aviatrix, was badly injured when her machine was wrecked at a village near Lisbon.

Mrs. Keith Miller, Australian aviatrix, who won the women's low powered open race at Cleveland, was eighth in the National Air Tour. Col. Cone in a Commandaire took seventh place. Part of Mrs. Miller's fine flying included a ground loop on a hard runway, avoiding a boy walking on the field. Miss Harrell, flying a Moth, had the misfortune to crash her machine by landing without gas and endeavoring to avoid a machine taking off.

"Don't forget to eat plenty of food and throttle back," ran a wire from Mr. Haizlip to his wife during the Air Tour. She was flying an American Eagle and finished in a good place, but well outside of the first ten.

Nine active women pilots have registered at the London Air Park at Hamworth. They include Lady Craven, the Honorable Mrs. Evan Morgan and the Honorable Mrs. Loel Guinness. Tuition fees in Britain cost about 25 pounds, that is, about $125.

The first week in November has seen the Boy Scouts giving flying exhibitions with models at Col. Fitzmaurice's Field on Long Island. Among the judges was scheduled Miss Earhart, from T. A. T.,

AN OPEN LETTER to Ambitious Young Men

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Miss Elinor Smith, Assistant of a New York Aerial Service Company, Capt. Frank Hawkes, and Col. Fitzmaurice.

Miss Elinor Smith, before accepting her New York job, has had some very interesting work, including a forced landing at Bellanca Field, and a visit complete with Parachutists to the Cleveland Air Races.

One of the newest recruits to the great school of aviation is Mrs. Neva Paris, who completed a dual transcontinental trip on her Curtiss Robin in the Women's National Air Tour in September. Both she and Mrs. Weber have contracted speaking engagements also before the Barbizon Club, the Women's University Club, the Young Women's Christian Association, the Women's Overseas League, the Women's Civic Club, the Philomusian Club, Philadelphia, the Quota Club and the Junior League, Bridgeport, and finally the Women's Civic Club at Bogota, New Jersey.

Mrs. May Lesser was one of the many women pilots attending the call to organize sent out to the licensed women pilots at Curtiss Field on November 2nd. She was one of the many who decided to fly to this meeting in her Gypsy Moth. She wrote she was coming if she "had to crawl." Bertha McCullough of Texas, a flying school teacher, wrote that she was too far away to attend, but she hoped that her letter might represent her. The name of the association and an appropriate pin was scheduled to be brought up for discussion.

The Wichita papers have had much to say about the sad death of the girl who dropped with a parachute that failed to open at that town. The claim against the Irving Parachute Company is that she had only one parachute with her and she was not fully qualified to judge her own aptitude, having been at a late party the night before.

Miss Bobbie Trout of Los Angeles, and Elinor Smith are preparing to attempt a woman's refueling record close to the State in a "Sunbeam." We certainly wish them the best of luck.

Miss Betty Huyler has been appointed saleswoman by the Curtiss-Wright Flying Service, New York.

Amelia Earhart has arrived in St. Louis to undertake the transportation of women in machines of the TAT. She will lecture on her trans-Atlantic journey and the Women Pilots Association.

The Glendale Flying Club of North Hollywood has formed a women's section with twenty members.

Three women, Vera Dawn Walker, Mrs. Florence Barnes and Margaret Perry, completed the All-California Air Tour on November 7.

Mrs. Edith Foltz of Portland has been appointed co-pilot on a special trip of the West Coast Air Transport.

The Women's Aeronautical Association of Kansas held a fine tea meeting at Mrs. Hutton's house. Eighty-five people were present. There was a pleasant program. In October, they met at the Hotel Lassen and Professor Petroff outlined to them the university's plans for an Aeronautical department. On November 11, they assisted in the official welcome to the Midcontinent Air Express. Mrs. MacShort, the secretary, presented a beautiful bouquet of chrysanthemums to the plane's pilot.

A "cooled off" balloon coming to earth at Tempelhof.

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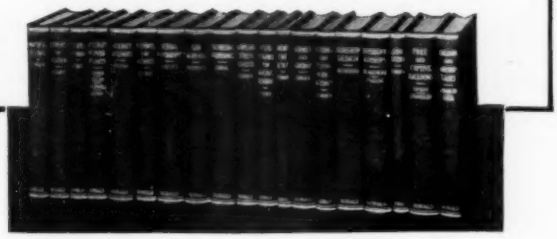

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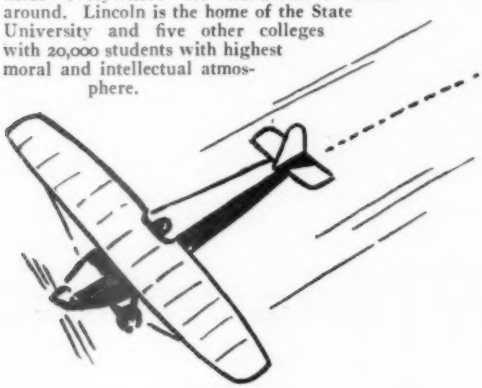

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[*Continued from page 25*]

acquire the feel of the ship and became more proficient in making it respond. Practice in straight flying and banks was obtained while circling the field for practice landings.

At the end of four hours Shaw had mastered everything but landing. In instructing the student to judge gliding angles a certain portion of the field was designated in which he must attempt to land. He was instructed to use his own judgment as to the proper time to throttle his motor and to pay especial attention to the angle of glide assumed by the plane. While at first his judgment proved poor, by continued practice the student became acquainted with the gliding angle of the plane and was able to make creditable effort at landing in the designated space.

Practice was continued until after seven hours of instruction Shaw succeeded in making three circuits of the field without the instructor correcting him on the controls. He was then considered ready to solo but while final instructions were being given on the ground, a storm arose and high winds and rains prevented the flight.

Early the next morning Shaw was given forty-five minutes additional instruction and informed that he was ready to solo. It was explained by his instructors that the ship would gain more altitude and have a longer glide due to the loss of the weight of the instructor.

Shaw made a good solo flight, circling the field and setting the plane down easily near his instructors. At no time during the entire course did the student show signs of nervousness. Calm and logical discussion of the relative safety of air travel seemed to have the desired effect.

Just what conclusions might be drawn from the successful completion of the flight were discussed by Blaine Tuxhorn in pointing out disadvantages encountered by the general public in taking up flying for pleasure purposes.

There are three great disadvantages that the average person in moderate circumstances meets in owning a plane for pleasure purposes. First, the initial cost of airplanes today is high in comparison with the cost of automobiles, the most popular mode of transportation. Second, insurance rates are prohibitive. To completely insure a moderate priced plane costing between three and four thousand dollars, including coverage for fire, theft, crash and liability it requires an expenditure per year of approximately one-third of the cost of the plane itself. Third, the cost of learning to fly a plane safely under the present system requires not only considerable expense but more time than the average person has at his disposal.

With improved production methods and a gradual stabilizing of the industry the price of airplanes should become lower. Likewise with increased safety factors in airplane design and with the acquisition of statistics from which to base rates, insurance rates should reach a reasonable level.

With the development of airports and service stations throughout the country it is scarcely necessary for the private flyer to be able to repair the plane or engine in event of an accident. He must, however, have plenty of experience in flying and be able to handle any situation that might arise.

The length of time required by the average person in learning to fly will always depend to a great extent on the airplane itself. Airplanes must be made safe and people must be made to realize their safety before a universal usage of air travel takes place. Any airplane may be wrecked by an incompetent pilot and probably will be able to be wrecked in the future. However, every day marks countless injuries and many deaths from automobile accidents and if the public is to enjoy the advantages of air travel they must be prepared to accept the few accidents which in relation to miles flown are less than those encountered in the motor car.

It is Tuxhorn's theory that by offering a method of flying instruction that will enable the student to concentrate his efforts into a short period of time and materially lessen the cost of obtaining instruction, flying will be placed on a basis nearer the reach of the average person. While a student who has soloed is by no means an accomplished pilot he is then in a position to secure flying experience at the minimum expense. A reduction of the cost in learning to fly and the designing of safer and more economical airplanes are the two most important features in placing the airplane on a commercial basis.

FAIRWAYS FROM THE SKYWAYS

[*Continued from page 30*]

who photographs golfing terrain from the air.

This Washington cavalryman harnessed the airplane for a unique use even before he planned his first golf course from the domain of the clouds. Down in Texas, he used a flying machine successfully in scouting out the most advantageous locations for certain duck blinds and sink boxes which he and his friends used subsequently. Just another illustration of the use of the airplane for going to points via birdline course and swift passage which otherwise would be most inaccessible.

The best season for air surveys in a thickly covered country is during the late fall and early winter months after the leaves have fallen from the trees. A golf course survey of new and virgin territory can then be made under ideal conditions. The air pictures and topographic maps are thereafter available as the guide-posts of potential design and construction.

Leading golf course architects who have been queried regarding the practicability of airplane use in golf architecture have invariably reacted enthusiastically to the innovation. They say that the use of aircraft will eliminate many of the most stubborn perplexities which heretofore have complicated links design in rough, rugged and timbered localities. These sports playground planners, however, confess their present inabilities to utilize aircraft assistance because of their ignorance of aviation and such of its ramifications as the translation of strip mosaics and other aerial art work. They report that flying knowledge will be prerequisite as a future feature of their profession. Which, unquestionably, will be surprising news to the older generation of those who enjoy the ancient and honorable pastime of propelling a diminutive white spheroid from tee to cup in a minimum number of strokes.

To the airminded masses who strive to keep apace of aeronautical consummations, the signing of the plane as the golf mapper's minuteman is but another step in a stairway of conquests. Trained flying has already made important contributions to the realm of national and international sports. Perpetuity will probably record even greater gifts to competitive and organized play from aviation.

Another article by Mr. G. H. Dacy, discussing new experimental parachutes, will appear in an early issue.

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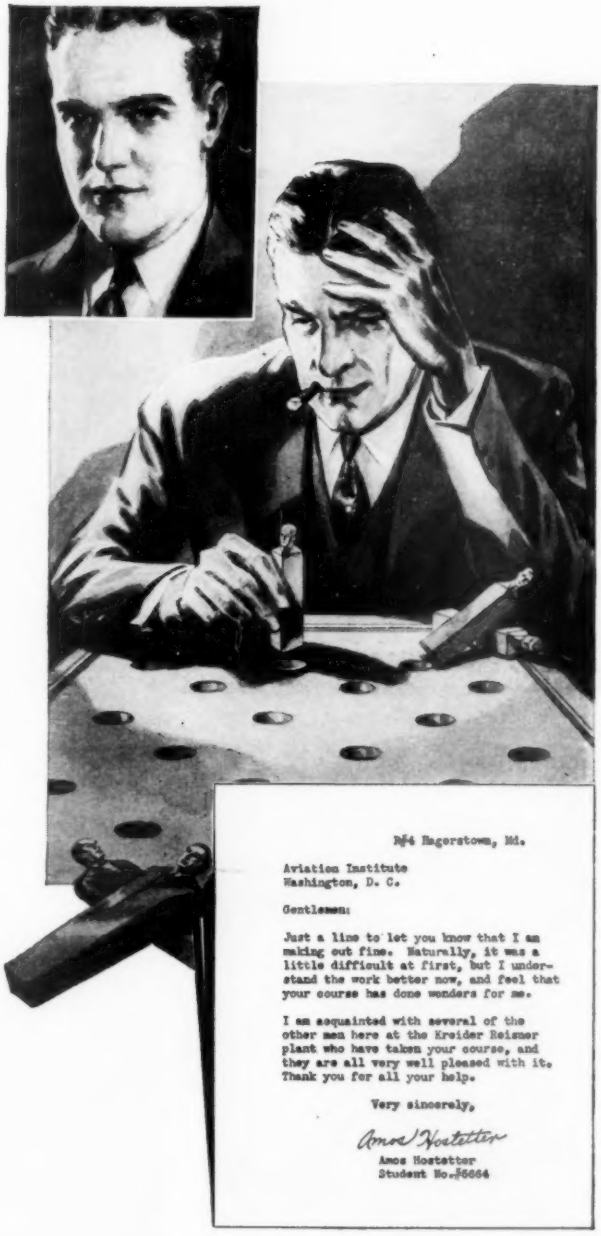
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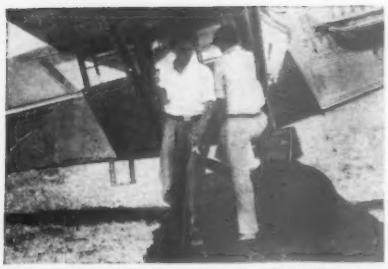

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MODERN AIRPORT CONSTRUCTION

[*Continued from page 23*]

visibility. At the Grand Central Airport in Los Angeles two runways, one of a hard surface material for taking off and the other, a yielding, all-weather landing strip, have been installed. This is an interesting experiment. The weather landing strip consists of a 4"-layer of sand placed upon a natural soil base.

This layer was treated with 3.2 gallons of road oil containing 70 per cent asphalt per square yard. Before being rolled to completion this mixture was harrowed and mixed in place with several inches of the natural soil. It formed a layer of sand-soil-asphalt six inches thick. It is dustless. Runways which have a tendency to permit the stirring up of dust and dirt are objectionable. So long as they exist they will cause the airport to give rise to an impression similar to that which one receives in the grease and grime-besmeared garages and filling stations so common today on our automobile highways.

Various and vexatious new problems will arise in construction, not only in runways and those other elements with which we are more or less familiar, but also in the million and one unknown elements which at best we must guess at until our knowledge of the possibilities of airplanes and airports develop. For instance, great spans may be required for the easy handling of large trans-Atlantic planes. As a forerunner towards the solution of such spans one may call attention to a new type of span, designed to be a quarter of a mile in width, which is being worked out on the principles of the suspension bridge. This idea, you may readily see, is fraught with unlimited possibilities. Another stimulating conception, now in the process of being born, is the underground airport. If such ports are developed, architects and engineers may find it necessary to develop an original type of construction in which the roof surfaces will be so fashioned as to receive the impact of the heavily loaded planes while at the same time permitting light and air to penetrate to the rooms below.

Quite in line with the foregoing may come speculation concerning what may be the consequences of the simple fact that the safe gliding angle and the safe taking off angle of the fast transport planes is as seven is to one. This ratio means this: if a building is located in the vicinity of an airport, for every foot of the building's height, the walls must be set back seven feet in order to present no obstruction to the arriving and departing planes. In short, a building fifty feet high would have to be set back 350 ft. from the edge of the field. The Woolworth building, to take a concrete example, is 792 ft. high and it would have to be set back from the field 5,554 feet, or a little more than a mile. Perhaps our cities may develop under the influence of this mysterious ratio of 7 to 1, the buildings rising in that proportion as they recede from the field. This would give the effect of a huge Yale bowl, provided, of course, that the city is built with attention to symmetry about the airport field. Perhaps the roofs of the buildings will be set at a slope of 7 to 1, sloping downwards towards the field.

What is aviation going to do to our architecture? It is going to change the whole range not only of building, but of our way of life. It is going to do this just as the automobile has been doing it for the past twenty years. And the airplane in the future is going to pass into the hands of the commonalty just as the automobile has done. The cities of the future will be of a spreading type, having relatively low buildings and equipped with many—thousands—landing spaces. These landing spaces may not be large in themselves, because if the auto-gyro plane continues its march towards perfection, it will be possible to rise and land in a very small space. Already it has been perfected so that not more than 25 feet square are required for landing. The future city will spread out like the wings of a monstrous eagle. There will be no more skyscrapers to astonish the tourist. What towers there may be will serve as mooring masts for giant dirigibles.

We need another Jules Verne of a modern day to help us imagine the vast and strange ramifications of the science which has mastered the air. Perhaps the possibilities would soon exhaust even the ingenuity of a Verne. In any case there will be the thrill for all of us whose imaginations are sluggish when we are placed face to face, suddenly, with the prodigies of achievement which seem to have been born out of the impossible.

AERIAL NAVIGATION

[*Continued from page 38*]

An aircraft somewhere S. W. of the beacon station hears "V" and takes the time from the first minimum as 12.5 seconds. The beam at the time under consideration was making angles of (12.5 x6) or 75° and 225° with the meridian through the beacon station. Since it is known that the aircraft was bearing about S. W. of the station the required bearing is 225° from the station. If the time to the second bearing be taken also a bearing of 225° should be obtained, this forms a useful check. In the second example the time is assumed to have been taken from "Q" to the first minimum 14.2 seconds. This gives us the following:

14.2×6=	85.2
Then the true bearing is	
•(85.2+90)=	175.2
or 175.2+180=	355.2

When laying down position lines obtained from a rotating beacon, it must be borne in mind that the bearings are from the station and not from the aircraft.

The Conversion Angle

RADIO waves travel in straight lines so that all radio bearings are great circle bearings. This fact will have a very important bearing on the projection of the airway maps of the future as radio navigation becomes more general and is used over greater distances. Then all aerial maps will automatically be on great circle projection. This is not the case at present, however, a large number of Mercator maps being in use, hence the necessity of considering the Conversion Angle when dealing with radio bearings. A straight line on a map on Mercator's projection represents a rhumb line on the earth's surface, that is, a line that cuts all the meridians at the same angle, whereas a line representing a great circle on a Mercator chart is a curve convex to the nearer pole, and lies always on the polar side of the rhumb line joining the places. The angle between the rhumb line and the great circle is the conversion angle.

TABLE II

Value of Conversion Angle
(½ d. Long = 1°)

Mid Lat	Conversion Angle
49	45
50	46
51	47
52	47
53	48
54	49
55	49
56	50
57	50
58	51
59	51

The conversion angle may be calculated from the following formula:

Conversion Angle=½d. Long. × Sin. Mid. Lat.

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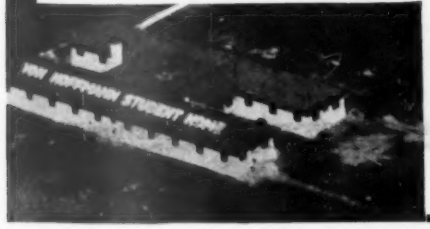

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In practice it is sufficient to take the difference of longitude and middle latitude (i.e., the latitude midway between the two positions) to the nearest degree. The approximate D.R. position must be known in order to find the conversion angle, but considerable error in the D.R. position will not seriously affect the calculation. A table for variations of the conversion angle for middle latitudes from 49° to 50° is given (Table II). Similar tables can be worked without difficulty for other latitudes. The following examples will make its use clear:

Calculate the conversion angle when the D.R. position of the plane is 50° 21′ N. 06° 20′ W. and the position of the radio station is 54° 14′ N. 15° 19′ W.

Diff of Long (approx)	= 9°
½ Diff of Latitude	= 4.5°
Mid Lat	= 52°

From Conversion Table the angle for Mid Lat 52° and ½ D Long 1 = 47′. Multiply 47′ by 4.5 then the conversion angle is 211′ or 3½°.

Having found the conversion angle it must be correctly applied before the position line can be laid down. The following rule holds good for all maps on Mercator's Projection: In the Northern hemisphere add the conversion angle to the great circle (radio) bearing between 0° and 180° and subtract the conversion angle from the radio bearing between 180° and 360°. It is claimed that using this method it is quite feasible to obtain position lines from stations as far distant as 1,200 miles without sensible error.

The above, I hope, has made clear the practical use of at least some of the existing radio aids to aerial navigation. In the next issue of AERONAUTICS I hope to deal with Maps and Charts. This important aspect of aerial navigation has been side-stepped in the earlier chapters in the hope that the powers that be in the various countries would have got together and standardized on aerial maps. This seems just as far away as ever and next month we will just take them as they are. Maps and Charts, Land, Marine and Aerial—all are used by the aviator.

PANCAKE RADIO RECEIVER

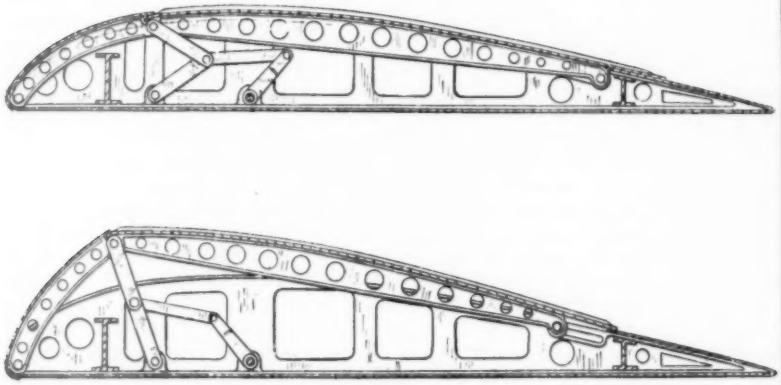
[*Continued from page 41*]

likewise be mounted in the plane. The three sets of interchangeable tuning coils embrace the following respective frequency ranges—250 to 400 kilocycles, 400 to 850 kilocycles, and 850 to 1,500 kilocycles. This newly introduced radio outfit can form agreeable "company" with any one of the three standard aircraft radio receivers now in the service of the United States Army. Likewise, it functions in conjunction with the present intertelephone radio sets.

Withal, it probably represents the greatest single recent advance in receiver-design development for airplanes and the unit is being duplicated in quantity production by the General Electric Company, at a cost of $800 each.

Flip and Flop—mascots of Misses Przymus and O'Neill, student flyers, Great Northern Aviation School.

The Swelling Wing



The top figure shows the wing in normal position for fast flying. Below, the "swelled" wing allows for greater lift and a slower landing speed.

THE recent invention of the "Swelling Wing," developed by Robert B. McElroy of Portland, Oregon, gives the pilot of an airplane better control of his ship, it is claimed, than any device now in use. It is possible for the aviator to change the shape of the wings, while in flight, so they are adapted for either weight lifting or fast flying.

When taking off with a heavy load or in landing, the pilot can adjust the shape and curve of the top of his wings and thus increase their lifting power. Once he has gained safety altitude, the wings may be flattened out. The latter will cut down head resistance, increase his speed and conserve his fuel. The former will allow a low landing speed, a thing which is considered highly desirable.

Although considered primarily from the standpoint of importance to the passenger carrying monoplanes, the Swelling Wing is adaptable to all types of airplanes. It is easy to see the important part a wing of this type might play were the heavy bombing planes of the government so equipped. Not only would it increase the cruising radius of such a ship, but through the added speed, which would be impossible in an ordinary high-lift wing, the bomber could escape the attack of lighter ships.

There is still another important safety factor found in the Swelling Wing, the patents of which are controlled by the Industrial Development Company of Portland, Oregon. This is the ability of the pilot to thin down his wings in the event of a stalled motor when he takes off. Ordinarily a high lift wing has such a tremendous head resistance that when the power fails the plane will either drop abruptly or slide off on one wing. If the ship were equipped with this new wing, the aviator simply would change the shape to a speed flying wing and glide to a safe landing where otherwise he probably would crash.

The mechanism which changes the contour of the wings is so light that it would add but fractionally to the total weight of the ship.

Heretofore, airplanes have been strictly confined to the use for which they were built. The structural design which enabled a plane to lift a heavy load worked directly to its disadvantage when a high cruising speed was desired after the ship leveled off for flight.

Up-to-date monoplane manufacturers have all sorts of ideas on the shapes of airplanes' wings, and the inventor of the Swelling Wing has embodied, as nearly as possible, all satisfactory wings in one, constructed so the pilot can choose the shape best suited to his conditions.

In normal position, the Swelling Wing is shaped practically the same as the Clark-Y.

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A LETTER FROM LOUIS BLERIOT

[*Continued from page 19*]

soon, I hope, be studded with stations like the land routes, which stations I believe will be floating islands.

I have the greatest confidence in the success of these islands, principally islands of the Armstrong system, and when in a few years the infra-structure of the aerial lines will be constituted by these islands, spaced at about 500 to 600 kilometers, the dirigible will have lost its advantage. The aeroplane, much more swift, much less sensitive to the atmospheric elements, will immediately resume its monopoly of aerial transportation. It will, obviously, be necessary that these islands should be numerous, and that they should be inter-connected with herzian waves, making it possible to go from one to the other without leaving their zone, and it will also be necessary that they be supplied with all the radiogoniometric apparatus and with wireless telephone, so that the aeroplanes will with certainty find them, in case one of them should be surrounded by fog, so that it can indicate to the aeroplane the nearest island that will be completely free.

The equipment to be employed for the use of these islands should have the maximum of strength, and it is in the study of this future aeroplane that I have specialized myself.

I have considered several aeroplanes answering for this purpose, and the form that I visualize as the best one is a plane with several motors accessible during the flight, but provided with wheels or skis for landing on the floating islands. In order to be prepared for the eventuality that, as a result of exceptional circumstances, it would be necessary to alight on the sea, the principal cabin of this plane is constituted of a life-boat completely decked and enclosed and sufficiently solid to withstand any storm. This boat is provided with water-ballast compartments, and a small special motor, and is able to carry all the necessary provisions and wireless telephone apparatus. It leaves the aeroplane, by which it is carried, automatically or through some mechanical means and, as soon as it is released, it has nothing more to fear.

What speed can existing communications of this kind furnish? I estimate that one can count on an average speed of 200 kilometers, which would put France at least 30 hours from America under the present flying conditions, but the flying conditions, especially in aeroboats designed in this manner, can change with the altitude, and nothing prevents one from conceiving that, if this life boat is air-tight, it can be used as the habitation of passengers for navigation at an ever greater height. But the altitude is one of the conditions that can most favorably be adapted to great speeds, as each thousand meters gained in altitude noticeably increases the speed if one retains the same motive power in the motors, which is easy with mechanical compressors.

Thus it will be seen that, as the aeroplane gradually rises higher and higher in the sky, the number of hours that I have indicated will also be gradually diminished, and it is not rash to foresee that some day this number of hours will be reduced by one-half, that is, that it will be possible to go from France to America in twelve hours: it will only be necessary to travel about 13,000 meters high in an air-tight boat.

How long will it take before this becomes a reality? This depends upon the financial effort and upon the technical effort made by the various countries. I am convinced that if America and France come to an understanding in this matter it will only be a few years before it becomes a reality.

I beg you, dear sirs, to accept the assurance of my respectful consideration.

Yours very truly,

L. Blériot.

P. S. I have intentionally abstained from speaking of the prophecies of certain engineers who foretell speeds of 1,000 kilometers per hour and more through the use of rockets, as I want to stay within the domain of possible and certain achievements.

AERONAUTIC LAW [*Continued from page 34*]

a death sustained while in or on any vehicle for aerial navigation, but the court denied a recovery under the policy, holding that the deceased was a passenger engaged in actual flying at the time of his death and that his death resulted from falling from a flying machine.

In the case of Pittman vs. Lamar Life Insurance Company (C. R. A. 5th Dist., 1927), 17 F. 2d, 370, the insured's policy excluded liability if the insured, within two years from the issue of said policy, died as a result of participation in aeronautic activity, either as a passenger or otherwise.

In this case the insured was struck by an aeroplane propeller as he was leaving the airship after completing a flight and was held to have met his death while participating in an aeronautic activity, the court holding that such restriction covered what was ordinarily incident to an aeroplane trip; that activities do not begin or end with actual flight but include presence or movements in or near the machine incident to beginning or concluding a trip.

In the case of Pacific Mutual Life Insurance Company vs. Van Fleet (1910), 47 Col. 501, it was held that an isolated instance of taking part in a balloon ascension resulting fatally did not void the insurance, where the issue was whether the act of the injured party constituted a change of occupation within the meaning of the policy.

In Sovereign Camp Woodmen of the World vs. Compton (1919), 140 Ark. 313, a clause prohibiting the insured party from participating in aviation was held applicable solely to civil aviation, but not to military aviation, where the insured party was drafted by the government, assigned to aviation service and killed in training.

"X" EXPERIMENTING with a plane newly designed by him for police service, flies his plane from the United States to Canada. There, a Canadian hireling of a bootleg outfit, for the purpose of harassing him, claims that "X" infringed on one of his patents and attempts to attach "X's" plane. Can he do so?

There naturally are many conflicting claims to basic patent rights. To permit their broad enforcement by nations or countries over which or into which foreign planes fly would interfere greatly with the development of aeronautics.

So, to prevent attachment of crafts by nationals of foreign countries claiming infringements of their patents, the International Convention of 1919, held in connection with the Peace Conference, adopted a rule which guarantees immunity from detention or seizure to foreign aircraft while within the air space or upon the territory of any other nation, on the ground that the construction or mechanism of the aircraft is an infringement of the patent design or model granted or registered in said state.

THIS department of Aeronautic Law is open, not only to the laity, but also to lawyers, legislators and city law makers as well. Address your questions of aeronautic law to Legal Department, AERONAUTICS, 608 South Dearborn Street, Chicago, Illinois. Replies will be by mail unless a special wire is requested. Some of the questions will be answered in these pages.

XUM

A. A. PRIESTER

[*Continued from page 42*]

Here again Priester's rules and regulations were the foundation upon which the operation of the line was laid.

Priester is a rigid disciplinarian. He is not a tyrant. He is a very understanding and sympathetic chief. One of the first pilots he employed for the Pan-American company was a man who had turned one of the P-R-T ships up on its nose. Fokker raved when he heard of it, but Priester's only comment was: "That was a mistake of judgment on his part; he is a good pilot,—and even you, Mr. Fokker, haven't you turned a tri-motor on its nose?" Fokker grinned, that boyish twinkle came into his eyes, and his reply was: "That, too, was a mistake in judgment."

Priester not only hired the pilots and mechanics for Pan-American, but he also recommended the equipment to be used. And he was and is as unbiased in his selections as only a perfectly honest man can be. He investigated every make of suitable airplanes available before he made his recommendations; but once made, those recommendations stood, and were defended,—until something more suitable for the desired purpose was produced. He is meticulous in his investigations; he can be swayed by nothing except absolute value; and he is courageous in his opinions. SAFETY is the keystone of his judgment.

As for hobbies and recreations: Aviation dominates every moment of his life, but he is never too tired to enjoy a musical comedy or a game of tennis.

Priester has helped in a remarkable degree to bring success to American air transportation. And he will help more, for he is a dreamer who not only dreams but who has the ability, the knowledge, and the stick-to-it-iveness to make those dreams come true.

THEY TELL US

[*Continued from page 40*]

that AERONAUTICS, by incorporating articles of a technical nature with charts, diagrams, etc., is losing part of its appeal to a number of readers who are not at all interested in technical subjects.

I can understand, of course, why you are including one or two technical articles in the make-up of AERONAUTICS each month, for you feel that by doing so you will appeal to a wider field of readers and take in a number of aeronautical engineers, operators and others who go to some other magazine, such as Aviation, for their articles dealing with the technical phase of aviation. Then, too, it may be possible that I am all wet in criticizing you for the inclusion of technical articles inasmuch as I do not know your editorial policies, etc. However, I am sure that you are always interested in hearing or receiving an opinion regarding the editorial contents of your magazine.

HUGH J. CROSSLAND, PUBLICITY DIRECTOR
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BOOKS OF THE MONTH

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Taking as a foundation his earlier book, Mr. Black has brought his subject up to date by rewriting antiquated parts and adding several new chapters.

These new subjects cover the subject of Aviation Law, Traffic Development, Air Transport Advertising, Estimating Operating Costs, Accounting in Aircraft Operations, The Investment Angle of Aviation, Aviation Insurance and Radio Communication in Air Transport.

His new chapter on advertising is particularly good, the author pointing out that air lines should not specialize on one advertising medium, but should reach out and study the various forms best suited to their requirements. He also stresses the mistake made frequently by many air transportation companies who seek the so-called "free" advertising—in news stories—almost exclusively to place their names before the public. "Press write-ups," the author points out, "do not take the place of time tables and descriptive literature and the editor does not append a convenient coupon with the necessary address and telephone number."

The chapter on Estimating Operating Costs is quite complete and offers a basis on which to figure the expenses concurrent with operation of air transport lines. Several tables given here were taken from Mr. Black's series of articles which appeared early this year in AERONAUTICS.

As the book now stands, it gives the aeronautical financier, executive, engineer and pilot a handbook of information that is thorough, and we are glad to recommend it to those interested in the phase of aviation it covers.

PILOTS' Luck, with drawings by Clayton Knight, and excerpts from stories and articles of Elliott White Springs, Capt. A. Roy Brown, Floyd Gibbons and Norman S. Hall. Published by David McKay Co., Philadelphia.

This is one of the most artistic volumes, picturing the part played by the flyer in the world war. The pictures, captioned with excerpts from war stories and articles, show the various phases of the life militaire.

The volume is printed on good stock and many of the illustrations are in color. Altogether, from a purely entertainment angle, the book will make an attractive addition to the aeronautical library.

THE Book of Airplanes, by Lieut. Cdr. J. W. Iseman and Lieut. Sloan Taylor. Published by Oxford University Press, New York.

Written with the idea of appealing to the juvenile mind exclusively, this book contains a history of flying from the "Balloon Age" to the present, with many illustrations showing the various makes of airplanes.

SKY High, The Story of Aviation, by Eric Hodgins and F. Alexander Magoun. Published by Little, Brown & Co., Boston. Priced at $2.50.

Here is another book that demonstrates the hold that aviation has taken upon the juvenile mind. It is historical, giving in simple form the steps that aviation has taken from the beginning. However, it is different from The Book of Airplanes (reviewed in this issue) because it does not accentuate the different types of planes, but rather the press onward of the whole art of aerial navigation.

THIS Aviation Business, by Ernest W. Dichman. Published by Brentano's, Inc., New York. Priced at $3.50.

"The purpose of this book," the author writes, "is to discuss the present aviation situation in a friendly and candid manner. . . . It is to be hoped that the debunking process will be received in the same spirit it is presented."

His chapter on "Aviation as a Career" should be read by everybody contemplating a flying career—it places the "aviation game" on an understandable basis and will save much disappointment for the candidate who expects to make a heroic fortune in a minute. And "The Financial Situation" chapter carries on the idea that "it does not necessarily follow that everyone connected with aviation will become wealthy," which seems to be the prevalent idea.

—covering the mechanical construction of modern airplanes and stability of a plane in flight—

The Airplane and Its Engine

By C. H. CHATFIELD and C. F. TAYLOR

Associate Professors in Aeronautical Engineering, Massachusetts Institute of Technology

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MONTHLY FINANCIAL REVIEW

[*Continued from page 39*]

believe was exactly the cause for the decline in other securities markets, only aviation, being a newer and more sensitive industry, felt the effects some weeks before the general crash. All of this comment is more or less in the nature of past history now for the declines have come, panic has passed and extremely low levels for stocks of every description are the order of the day.

The question now is what will the effects be and when can we look for a resumption of constructive activity. Already the government has taken official cognizance of the situation and at the present time Mr. Hoover is conferring with business leaders in basic industries in an effort to find and plan work which will take up the slack occasioned in general business. It is too early to see how well this untried method of resuscitation will work, but it is certainly a sensible effort in the right direction, being made at the best psychological moment. Undoubtedly we will have to wait until the normal Spring demand asserts itself before it will be possible to judge how badly business has been affected. When that time comes, if the demand is normal and healthy and of sufficient volume, then it will be time enough to become enthusiastic again on the constructive side. Everyone hopes, undoubtedly, that this will be the case, but such a severe financial convulsion as we have been through is inevitably bound to have a bad effect on the business of the country and whether it will be righted by next Spring or not is a question.

Meanwhile, for the man with surplus funds available, there are amazing bargains to be found in every department of the list and among them the securities of the half-dozen outstanding aviation companies represent as good purchases for long pull speculation as any others.

During this month of financial stress there has naturally been a complete halt in constructive financing operations. The only two new companies of any importance are the *Dornier Corporation of America*, formed by General Motors and the Fokker Aircraft Corporation with a capital of 50,000 shares of no par common stock, and the *Pacific Zeppelin Transport Company Ltd.*, organized to provide an airship service between the West coast and Hawaii. The Dornier Corporation will have the rights to build the all-metal flying boats of the famous German design in this country. The Zeppelin Transport Company will be closely connected to the Goodyear Zeppelin Company and will have banking support from such well-known firms as G. M. P. Murphy & Company, Lehman Brothers and W. A. Harriman & Company.

Earnings:

The Aviation Corporation report for the period from March 1st to August 31st shows a net profit after all charges except Federal taxes of $1,040,412, equal to approximately 33c per share on the common stock outstanding.

National Air Transport, Inc. showed a profit for the quarter ended September 30th of $234,221 after charges and Federal taxes, equal to 38c per share on the 635,060 shares of stock outstanding. This compares with earnings of 23c a share during the same period in 1928.

Thompson Products, Inc., reports net profit of $1,138,263 after charges and Federal taxes for the first nine months of 1929, equivalent after preferred dividends to $4.25 a share on the 262,660 shares of combined Class A and Class B common stock.

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BUFFALO PUBLIC LIBRARY ART DEPARTMENT

FROM THE PUBLISHER'S QUILL

[*Continued from page 11*]

with the McMullen Flying School.

An excellent plan could be followed in cooperation with the R. O. T. C. At the University of Illinois, military training is compulsory. The R. O. T. C. maintains six units there, one of which is an air corps unit. A two year basic course followed by a two year advance course is available. Two hundred and thirty-two students are enrolled in the air corps unit and upon graduation are eligible for enrollment as flying cadets at Brooks Field or Riverside Field.

At the University of Washington, a U. S. Naval Training Unit offers college students a course with some flight training and the students of the New York University have some opportunities for flight training by joining the R. O. T. C.

The suggested plan adapts itself readily to many variations. The college could offer its students a flight training course within the authority of the school, without it, or in combination; in conjunction with classroom work, or without it; in connection with an aeronautical degree, or without it. The college could maintain its own flying field and equipment, or operate under agreement with a local commercial flying school. The actual flight training could be treated as a separate school under the College of Engineering; it could be offered as an added unit of the R. O. T. C. training (already maintained at most colleges), or it could be treated as a definite sport, a non-curricular activity like football, tennis, or polo. This latter suggestion would afford some rather unusual opportunities for developments in intercollegiate aerial events.

We lay no brief for this thought other than that it affords an opportunity for America and the aviation industry to train and develop the cream of its youth in the knowledge of the air which in due course will have a far reaching commercial and military effect.

IN UNITY THERE IS STRENGTH

IT is strange that so little directed effort—and no concerted effort—is being directed toward making the public effectively airminded. We differentiate between the airminded enthusiast who is thrilled at the sight of an airplane and the effectively airminded, who actually correlate the aviation industry with their own businesses or pleasures.

There are a few isolated instances, disjointed efforts, where attempts are made to educate the public. One or two aviation publications have gone forward into non-aeronautical fields to carry the messages of aviation. A few general magazines and many newspapers are devoting regular space to the subject of aviation. Some individual aeronautical advertisers have run educational copy. Various aviation associations and the Department of Commerce have contributed with excellent information releases.

The transport lines, which afford the primary medium for making the public effectively airminded, have made very little effort to promote aviation among the public beyond advertising their timetables. This lack of effort is not through lack of proper foresight. We daresay most air transport operators would be very anxious to educate the average man to air travel but it is unsound economically and wholly unfair for one or a half-dozen operators to take it upon themselves.

The need for a concerted action is evident. In other fields of commerce, cooperative action is abundant. There are about 70 varied associations doing national advertising on a large scale, not including Chambers of Commerce. Even a Wooden Cigar Box Booster Club advertises in national magazines and newspapers, and the Switzerland Cheese Ass'n of Berne, Switzerland, have used the Saturday Evening Post. Cooperative groups as the National Confectioner's Association spend between $100,000 and $250,000 in national advertising.

The public could well stand education on the beauty, the safety, the comforts and savings of air travel. Air travel is far from being an accepted mode of travel. Anyone who has done any commercial air traveling is familiar with the strange and awed group of onlookers and travelers. The attitude "I'll keep my two feet on the ground" is only too common.

We have been informed that a plan is on foot for five airline operators to pool $250,000 for promotional purposes to include an air travel advertising campaign in aeronautical, general and business publications. We understand that each of the five is to provide $50,000, three having already indicated their agreement.

Such a fund should be supported by every air-line operator in the United States. Such a fund or group effort should develop to the point where it would include all engaged in the aeronautical industry, who could be benefited by a campaign to make the general public familiar with the valuable applications of aviation.

Air transport operators at the present time are spending on the average 5% of their total gross revenue for advertising purposes. A Canadian airline spends as little as 1.03%, a leading Southern line spends 10%. The gross revenue for air transport lines (incomplete returns) during 1928 was approximately $8,000,000. Let us assume that 1929 will show an increase of only $2,000,000, or a total gross revenue of $10,000,000 for the year.

Accordingly, it can be gauged that air transport operators without any increase in advertising appropriation will have available 5% of $10,000,000 or $500,000. Assuming that air transport operators retained 50% of their advertising ap-

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We are forming a group of Pilots, Students and Air Travelers to obtain the benefits of Group Insurance at low cost.

Modern Aviation Is Safe but accidents will happen as they do in every industry. Pilots, student Pilots and Air Travelers should have protection for their income and their loved ones.

No Obligation—No Cost

With a Group of 5,000 we can influence Leading Insurance Companies to issue liberal accidental death and disability policies. Show your co-operation for the Rapid Progress of Aviation—Join with the group.

AVIATION ACCIDENT ALLIANCE

INCORPORATED NOT FOR PROFIT

105 W. Madison Street CHICAGO, ILLINOIS

propriation for local advertising and direct mail, and devote the balance to co-operative institutional advertising, a fund of $250,000 would be available.

No new aeronautical association need be formed. All that is required is an agreement among air transport operators to provide an appointed advertising agency with an annual appropriation of, let us say, 2½% of their gross revenue. The promotion of this idea could come from any of the established organizations, from the air transport operators themselves, or even from some wide-awake advertising agency. But in any manner of initiation, the result would prove of great value to the air transport operators and the aviation industry at large.

TELLING THE WORLD

WE have uncovered an incident which we believe is unique in the annals of journalistic history. One of our readers, a Mr. Holmes, was so impressed with our October issue that he parted with ten of his own dollars to have the following advertisement inserted in the Washington, D. C., Star on Oct. 11 and 12. Five weeks later it was brought to our attention.

> ***JUNK***
>
> **Are Our Navy and Coast Defenses**
>
> **JUNK?**
>
> **Is our National Defense a back number, in the hands of "Bureaucrats"?**
> **Read Gen. William Mitchell in September "Aeronautics."**
> **Read Congressman F. H. La Guardia in October "Aeronautics."**
>
> WHAT'S THE ANSWER?
>
> Paid for by Joseph D. Holmes, Orange, N. J.

Appreciative as we are of Mr. Holmes' enthusiastic support, we feel that it is our duty to dissuade readers from too great a show of enthusiasm over the articles carried in AERONAUTICS. We don't mind a reader's telling all his business associates about this or that article, we even invite our readers to drop us a line when the spirit so moves them. If we are urged sufficiently, we may not even object to having an enthusiastic reader dictate a reminder to all his friends to buy a current copy of AERONAUTICS. And if a reader sends in a 3 year subscription, prompted by an enthused appreciation of The Publisher's Quill, we will with due appreciation place his name on the list of subscribers.

But—we really ought not encourage our readers to show their appreciation by running advertisements in the daily papers advising people to read AERONAUTICS. Such a matter as this might get way out of control. Just picture our dilemma if we were to wake up and find full page advertisements in the Saturday Evening Post or Vanity Fair urging people to pick up February AERONAUTICS "on sale at all newsstands." We would be busy querying the members of our organization to find out who was responsible for the wild extravagance.

Then again some readers might feel peeved about any of our disparaging remarks (if we do have any such readers and if we do make any such remarks), and run an advertisement telling the world what a punk magazine AERONAUTICS is.

So—really, Mr. Holmes, and similarly minded readers, it pleases us immensely to know that you are with us and enjoying our articles, but don't, oh, please don't let your enthusiasm run away with you.

ANNOUNCEMENT

AERONAUTICS is privileged from time to time to be referred to by its readers for opinions on various problems. Sometimes, the matters referred to us are of vital importance and far reaching in effect, as was the case when Congressman Cable recently asked our opinion on the question of airline legislation.

We have therefore selected an outstanding group of men, each a leader in his respective phase of the industry, to serve on an AERONAUTICS ADVISORY BOARD. The members of the BOARD have kindly consented to serve as a reference body to which editorial policies and other matters may be submitted. Leaders in the following fields have been selected: Transportation, Aerodynamics and Structures, Women's Activities, Engineering, Dealers' Sales, Air Mail, Photography, Airports, Meteorology, etc.

The names of the members of the AERONAUTICS ADVISORY BOARD will be formally announced in the next issue.

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Before disclosing your invention to anyone send for blank from "EVIDENCE OF CONCEPTION" to be signed and witnessed.
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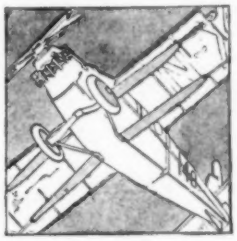

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PIONEER OF THE AIR

Justifying the absolute reliance placed in their precision, Longines have been exclusive time equipment on nearly every long distance flight in the history of aviation, including this year's outstanding achievements of WILLIAMS and YANCEY, ASSOLANT, LEFEVRE and LOTTI and the GRAF ZEPPELIN.

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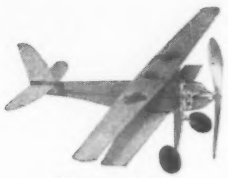

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Convertible high or low wing monoplane or biplane. Automatic angle of incidence. A fascinating experimental flying model, capable of several hundred feet of flight.

Ready to fly (both wings included).....$2.75

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One of the latest Silver Ace models with demountable tapered wings and celluloid fuselage. Superlative in performance and appearance.

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Convertible Cabin Type Fairchild-Stinson Monoplane

A de luxe flying model, easily convertible to biplane or seaplane. Wing span 30 inches, weight 3¾ oz.

Ready to fly monoplane	$12.50
Partly assembled	9.00
Knocked down	7.00
Extra wings, per pr.	3.50
Pontoons, per pr.	4.00

Silver Ace Low Wing Monoplane

F-21 type, beautiful in detail and color. Capable of several hundred feet of flight. Demountable wings.

Ready to fly.....$7.00

Silver Ace Tri-Motor Fokker

Designed to fly several hundred feet by power of central motor. Convertible into model of transatlantic "Friendship" by addition of pontoons.

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Construction set	9.00
Pair of pontoons	4.00

Sold by 1000 dealers; 50c extra if shipped by us.

Silver Ace Models

Winter Flying

If CHRISTMAS brings you a SILVER ACE, you won't have to wait months for warm weather to enjoy it. With these new pyralin skis, designed in type similar to those used by Commander Byrd in the Antarctic, you can, in one day, build a SILVER ACE Spirit of St. Louis or Fairchild cabin model, and fly it over deep snow and ice. Attachable with five minutes' work to all SILVER ACE convertible models or to our famous flying Fokker with special wires. Skis, $1.50 a pair extra at all dealers. Add 25 cents if shipped by us.

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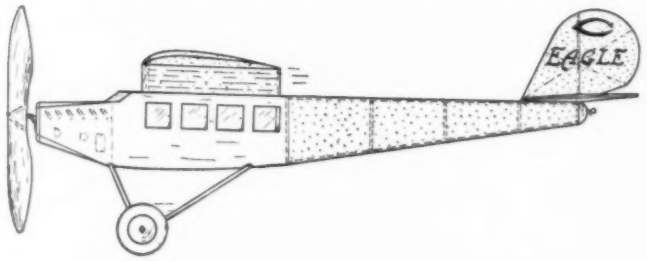
MODEL DEPARTMENT

by Bertram Pond

BUILDING THE "C" EAGLE



TO meet the great popular demand of a large number of readers of the Model Section of AERONAUTICS for fuselage models, we will begin the construction of a proven fuselage model known as the "C" Eagle.

This model is very simple to build, yet it looks very much like a real plane and it flies very well. The machine is of the latest type, having no motor stick—only a short stub at the front for making the changing of the propellers and installing new rubber more easily, and a plug at the rear for winding the motors with a winder.

The following tools are required: A knife, a ruler, a piece of sandpaper and some pins are all the tools needed unless you want to make your own wire parts. Then you will need a round nosed pliers and a good cutting pliers. A paint brush will be found to be a help in attaching the paper to the surfaces and for doping them.

You will need the following materials for constructing the "C" Eagle model:

Parts List

3	ft. 1/16" diameter reed for fin and elevator.
3	ft. 3/32" diameter reed for trailing edge.
1½	ft. 1/8" diameter reed for landing gear.
2	pcs. 1/20"x3"x20" balsa veneer.
4	pcs. 1/16"x1"x20" balsa veneer for ribs.
2	pcs. 1/8"x5/16"x20" balsa for wing beams.
5	pcs. 5/32" sq. x 20" balsa for fuselage longerons.
2	pcs. 1/4" sq. x 20" balsa for entering edge.
1	pc. 7/8"x1 5/8"x8 1/2" balsa propeller blank.
1	pc. 5/32"x1 5/8" sq. balsa veneer for nose piece.
1	pc. 1/2"x1"x1" balsa tail piece.
1	small piece of window material.
2	1 7/8" diameter celluloid wheels with bearings.
2	sheets 21"x31" Japanese tissue paper.
1	ounce Hoozier Glu.
1	ounce paper cement.
1	large bearing.
4	3/16" diameter washers.
	Wire parts or 12" No. 14 music wire.
	6" No. 16 music wire.
14	ft. 1/32"x1/8" fresh live rubber.

You will find these materials obtainable from some of the model supply houses advertising in our columns, or if you wish a complete kit, a letter directed to the Model Editor personally will give you the information as to where to obtain one.

In this issue we will take up the construction of the wing, propeller, rudder and elevator. In the next issue we will describe the construction of the fuselage.

Wing

THE first step in making the wing is to make a set of 12 ribs to the actual sized pattern shown in the drawing. Be very careful to make all of these ribs exactly alike in outline. However, for lightness 10 of the ribs can be cut out as shown in the dotted lines in the rib pattern. The two end ribs are left solid.

For those who wish to improve the appearance of their machine somewhat they can make two extra ribs and cement them unto the ends of the wing halves, shown in dotted lines, making a Spirit of St. Louis type of wing.

The span of the wing without these tips is 31", and with the tips 32". You should make the wing in two halves, spacing the ribs exactly 3" apart. The entering edge is made from a piece of 1/4" square balsa rounded off to fit the curvature of the ribs. With the ribs and spars held in position by pins (for quick and accurate assembly) you should cement the joints carefully with a good coat of Hoosier Glu.

Join the two wing halves together carefully by placing a 1" to 1 1/4" block or book under each wing tip. Use several coats of Hoosier Glu to join the spars together, being sure that each coat has dried before applying the next coat. Note that the two wing ribs over the fuselage are 1 3/4" apart and that they are spaced only 2 5/8" from the first rib out on the wing. The trailing edge of the wing you will note is made of 3/32" diameter reed.

When the wing is securely cemented together and checked for dimensions and found to be lined up perfectly it is ready for covering.

It should be covered very carefully by using 4 pieces of Japanese paper, each slightly larger than one-half of the wing. First, cement the paper to one of the ribs over the fuselage. (You will cover the center section last). Then cement the paper out to the next rib, carefully stretching out the wrinkles in the paper covering with the thumbs of both hands. Finish the cementing of the paper to the wing by proceeding one rib section at a time until the whole wing is covered. Then cover

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Airplanes

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Balloon Rubber Tired Aluminum Disc Wheels
2".....60c Pr. 1½".....40c Pr.
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4c postage on a pair wheels.

Ask your dealer or send 5c for illustrated catalog.

A. F. SELLEY MFG. CO.
1405 Gates Avenue, Brooklyn, N. Y.

Simplex Air Model Co.
AUBURN, MASS.

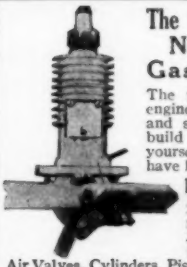
Send 5 cents for complete parts list. A 5 cent service charge is required on all orders amounting to less than $1. A 5 cent packing charge is required on all shipments of wood or metal greater than 18" in length. Prices are subject to change without notice. All goods sent postpaid in the U. S. A. No stamps or C. O. D. orders accepted.

	Spruce	Balsa
1/16"x1/8"x3'	.03	
1/16"x 1"x3'		.06
1/8"x1/8"x3'	.03	.033
1/8"x1/4"x3'	.045	.054
1/4"x1/4"x3'	.054	.06
1/2"x 1"x3'		.24
1"x 3"x3'		.48
1"x 3"x3 1/2'		.56

Reed 6' lengths, 1/16" diam. .05c; 1/8" .075c; 3/16" .10c; Balsa discs 1/8" thick 2" diam. .07c; 3" .08c; 4" .09c.

Ambroid dope, 1/4 pint .50; 1/2 pint..... .95
Ambroid cement, 2 oz. .33; 4 oz..... .53
Bamboo paper 13x36" .12; 24 3/4"x33 3/4"..... .14
Rice paper, 18"x24, .09; 21"x25"..... .06
Wood veneer, 20"x30"..... .22
Flat rubber 50' of 1/8", .50; 50' of 3/16"..... .75
Piano wire 3' of No. 5 or No. 8, .04; 3' of No. 11 or 15..... .06
28-30-32-34 steel wire, per spool..... .10
1/16" copper washers, 10 for..... .05

We can supply any size balsa that you need, also propellers, I beams, wing sections, bolts, nuts, screws, brads, aluminum, brass tubing, turnbuckles and books on model building.



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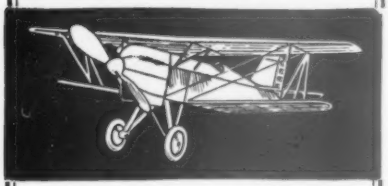

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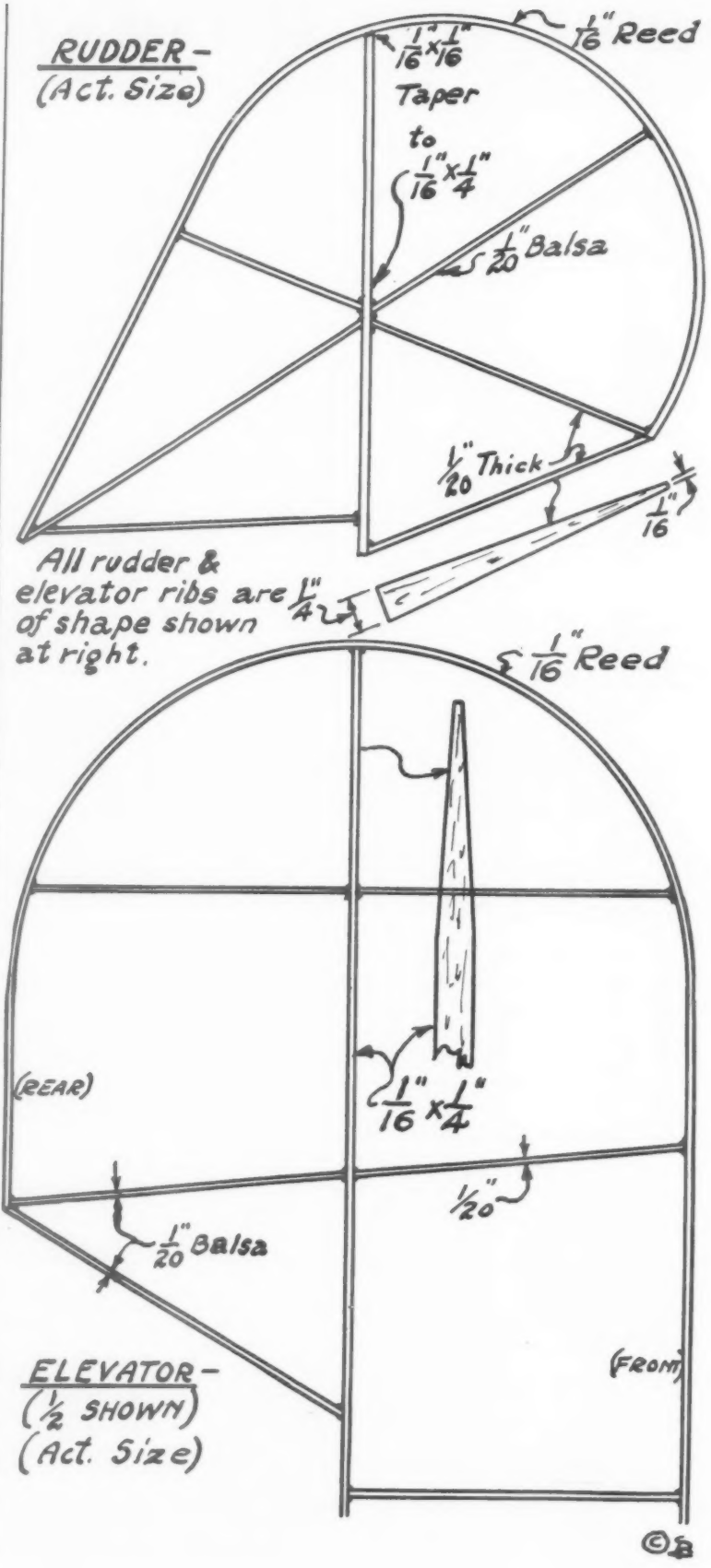


the top of the center section in the same manner. It will not be necessary to cover the bottom of the center section, as this space is closed by the top of the fuselage.

Note that the right wing tip should have 1/16" to 3/16" extra incidence to counteract the torque of the propeller. If you wish you may dope the covered wing with one or two coats of plain or colored dope. In case you wish to dope the wing you should be very careful to hold the wing in a slight twist when the dope dries to make sure that the right wing tip has the correct amount of incidence.

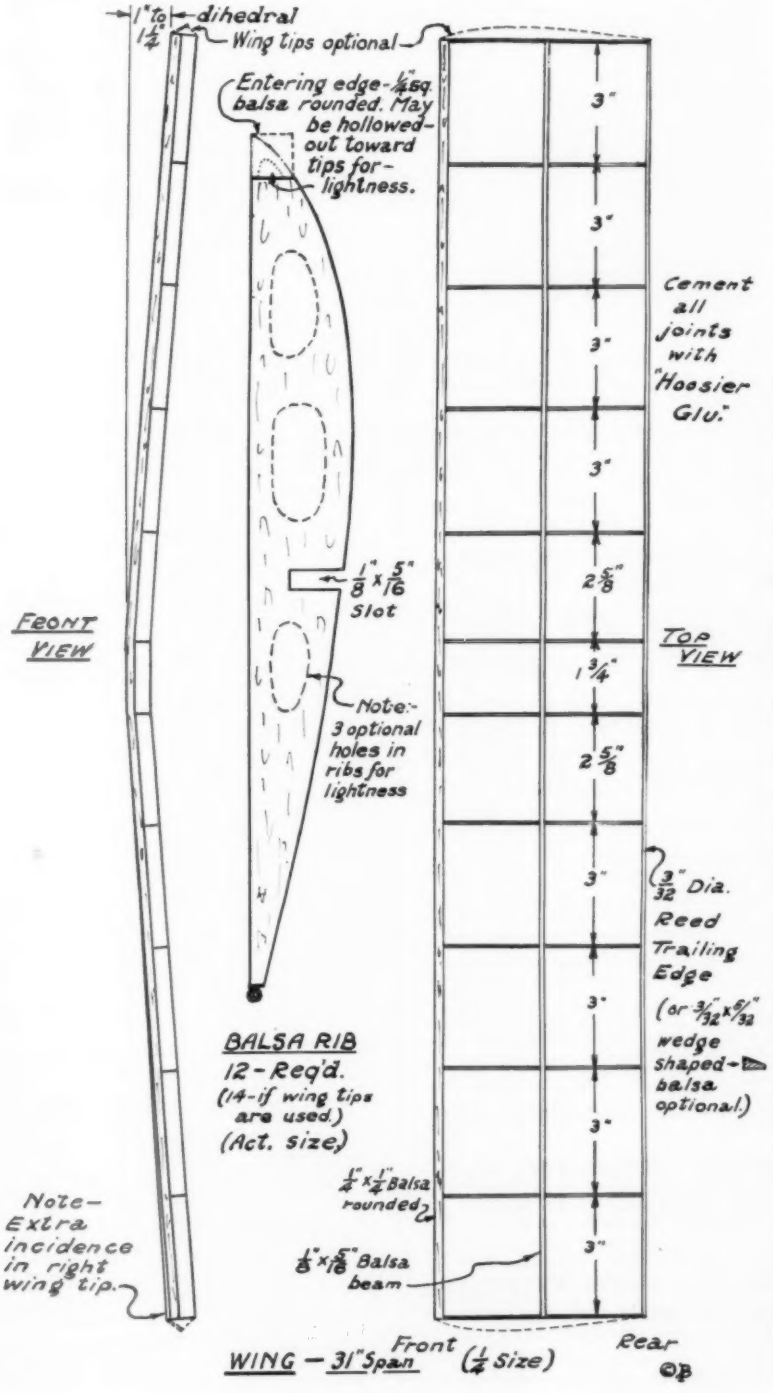
Rudder

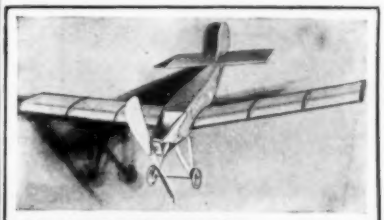
THE double covered rudder should be made as light as possible in the following manner: From the 1/16" thick balsa pieces that are left over after cutting the ribs cut a piece of balsa for the rudder upright to the dimensions given in the drawing. From the extra pieces that are left over from the edges of the 1/20"x3"x20" balsa veneer for the body parts, cut the rudder ribs. These are all of simple triangular section. They are cemented with their wide ends next to the rudder post in a criss-cross fashion. See the drawing. The bottom rudder rib in the front half of the rudder should be cemented 1/4" above the bottom of the rudder post. This is so that the rudder can be cemented to the elevator securely.

The outline of the rudder is composed of a length of 1/16" reed smoothly curved into shape and cemented securely in place. You may find it easiest to cover the rudder before attaching it to the elevator. At any rate, the bottom front rudder rib serves several purposes, one of them being to form a surface to which the paper can be cemented.

Elevator

THE back bone of the elevator consists of a piece of 1/16" balsa 1/4" wide and 10 1/2" long. The ends are tapered from 1/4", 1 1/2" back, to 1/16" at the very tip. Triangular pieces of 1/20" balsa veneer are used to form the ribs in the elevator in the same manner as they were in the rudder. To get the outline of the elevator and rudder true it is suggested that you make an actual sized sketch from the drawing or use the actual sized drawing which comes with a kit of materials. Place the parts on the actual sized drawing to check them for length, etc. When the framework of the elevator has been com-





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pleted, very carefully curve the reed to fit the outline and cement it securely in place.

Now carefully cover the elevator on both sides.

Special Note

THE rudder and elevator must be very light on any kind of a fuselage model using rubber band power in order to permit the wing to be attached in the proper position and still maintain a flying balance. The "C" Eagle is no exception. For this reason we suggest that you do not dope the covering on the rudder and elevator unless you substitute 3/32" diameter reed edging on both units. Otherwise the edging will pull out of shape and warp badly. Of course, if 3/32" reed is used the wing will be in a slightly rearward and consequently less efficient position.

Attach the rudder to the elevator with a very small drop of glue, as you may want to break the glue joint loose and change the angle of the rudder to make your model curve in flight.

Propeller

THE propeller on this model is selected to make good consistent flights. This model was not designed primarily for a great duration for fuselage models nor was this model designed for minute accuracy of detail. It is, however, a consistent performer with a good duration, considerable strength and a quite realistic appearance. The 8½" propeller fits into this scheme very well.

Draw diagonal lines across from corner to corner on the wide sides of the propeller blank. Carve the propeller in the usual manner, being careful not to round the tips until the pitch is definitely determined by the guide lines which you have laid out on the blank. Leave the hub somewhat thicker than on duration propellers. The hub should be ¼" to 5/16" thick. If you wish, it will do no harm to make a spinner on the propeller. The spinner should be conical in effect similar to the spinners used on large airplane propellers with a diameter of ⅞" at the rear and blending into a point at the front edge of the propeller.

The propeller blades should be thicker at the hub than at the tips. They should taper from 3/16" to ¼" on each side of the hub to about 1/16" to 3/32" in thickness at the tips. The rear face of the propeller should be flat or just slightly concave—not convex. The front face of the propeller blades should be rounded or convex with a slightly greater thickness at the entering edge than at the trailing edge. In fact, the cross section of the propeller blades should be similar in form to a high speed wing section.

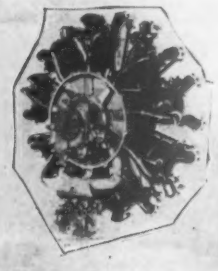
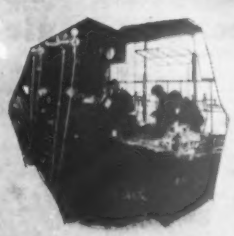
By the use of a paper pattern make both propeller blade tips exactly to the same shape. With coarse sandpaper sand the propeller until it balances on a knife blade at the center. At the same time you are sanding the propeller to balance you should true up the blades and even up their form and shape so that they are symmetrical.

With the propeller thus balanced, roughly, you should make a propeller shaft from No. 14 music wire to the actual sized pattern shown in the drawings. Insert the propeller shaft into the propeller hub from the rear. Bend a U from the part which projects through in front of the propeller. If the balsawood used in the propeller is soft you should protect the propeller shaft against pulling through the propeller by allowing several coats of cement to dry on the front of the propeller before piercing the point of the driving hook in the propeller shaft back into the propeller hub.

After the shaft is in position and lined up, carefully cement it securely in place so that it cannot work loose from the propeller. Several coats of cement should be used. After this cement is thoroughly dry and you have checked the shaft again for correct alignment, very carefully and accurately balance your propeller.

If you wish to finish off your model in fine shape, especially if you are using colored dope on the wings, I would suggest that you give the model a finishing touch by painting the propeller with silver dope. A coat of paper cement lightly sanded when thoroughly dry will make a good filler and foundation for the silver paint and make the silver finish much smoother than you could possibly obtain by silvering directly onto the raw balsa wood.

Next month you will learn how to build the light and sturdy realistic looking fuselage to complete your "C" Eagle model.

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A new contribution to flying from Alexander Soldenhoff, Swiss inventor.

AN absolutely foolproof aeroplane that cannot turn turtle even if crippled is the contribution to aviation claimed today by Alexandre Soldenhoff from his workshop in Zurich, Switzerland.

The new invention which Soldenhoff has named the "Arrow-plane" is a departure from any aircraft now in operation today. Instead of the wings being at right angles from the body of the plane, they slope backward and outward, like the wings of a swallow. In proportion, the tail is very small and has no part in the steering or elevation, but functions solely as a brake. All the rudders are on the back of the wings, the machine being so constructed that wing and controls are united. All elevation and steering is accomplished with flexible ailerons at the back of the wings.

The "Arrow-plane" is the result of fourteen years of study by Soldenhoff. The cross section of the wing of the plane differs down its length. Where it joins the body of the plane, it resembles that of any ordinary aeroplane, but in the middle of the wing, the angle changes, offering a different relationship to the windstream, and at the part of the wings farthest from the fuselage, the angle changes again in such a manner that there is no agitation of the wing at this point in flight.

It is asserted for the "Arrow-plane" that were one wing to become crippled or even be broken off completely, the plane will still fly. Elaborate tests of the new invention have just been completed at the Gottingen laboratory in Germany and the German aeronautical experts declare that, not only will the plane still fly when crippled, but their tests prove it has seven times the safety factor of any machine on the market today. Gottingen tests, as returned May 1, 1929, show the "Arrow-plane" will not capsize in air, turn turtle, do nose dives or tailspins at unexpected moments. So closely balanced is the machine in every part, that were one wing to be severed and dropped from a height, the wing will not turn and whirl as it falls, but glide slowly and gracefully upright to the earth.

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INDEX TO ADVERTISERS

Advanced Aircraft Corp. 56
Aero Corp. of California 56
Aero Engineering Service 56
Aero Model Co. 92
Aeronautica 57
Airtech Training School 56
Alexander Aircraft Co. 6, 88
Alexander Radio Electric Co. 82
American Eagle 85
Aviation Accident Alliance 90
Aviation Institute of U. S. A. 61, 77

Becker's 85
Bedford Y. M. C. A. Aviation Mechanics School 96
Berry Brothers 7
Boeing School of Aeronautics 98
Braley School of Flying, Inc. 56, 71

California Technical College 82
Cessna Aircraft Co. 47
Columbia School of Drafting 87
Curtiss-Wright Flying Service 78, 79

Detroit Board of Commerce 70
Deutsche Motor-Zeitschrift 57

Eagle Airways 56

Flug 57
Flugsport 57
Flug Woche 57
Ford Motor Company 2

Goodheart-Willcox Co., Inc. 65
Greer College 63

Hales & Hunter 57
Hawthorne Model Aero Co. 94
Henley, Norman P. Pub. Co. 59, 89

Icaro 57
Ideal Aeroplane & Supply Co. 95
International Correspondence Schools .. 72

Jefferson School of Aviation 56

L'Aerophile 57
Lancaster & Allwine 57, 91
Lincoln Airplane School 74, 75
Los Angeles Chamber of Commerce 4

McGraw Hill Book Co. 83, 87
Maddux Airlines 56
Mann & Benton 94
Marshall Flying School 55
Mason, Fenwick & Lawrence 57
Midland Model Works 96

National Aero Corporation 91
National Model Aircraft & Supply Co. 94
Nicholas-Beazley Airplane Co. 5

Pacific Technical University 85
Parks Air College 51, 56, 69
Peru Model Airplane Shop 94
Polachek, Z. H. 72
Power Model Supply Co. 93

Ronald Press Co. 73
Roosevelt Aviation School, Inc. 56

Selley Mfg. Co. 93
Simplex Air Model Co. 93
Southern Aeromotive Service 57
Spartan School of Aeronautics 49, 56
Spiliane & Company 57
Students Aviation & Trade Schools Finance Co. 56

Taylor Instrument Companies 45
-TP-Coal & Oil Co. 99

Universal Aviation Schools 82
Universal Aircraft Co. 53

Von Hoffman Aircraft School 81

Waco Aircraft Company 3
Wichita Flying School 56
Wittnauer, A. & Company 91
Wright Aeronautical Corporation 8, 100

FUTURE EVENTS

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JANUARY 13—S. A. E. Annual Meeting, Miami, Fla.
JANUARY 21—S. A. E. Annual Meeting, Detroit.
FEBRUARY 7-15—New York Aviation Show, Auspices of Aviators' Post, American Legion.
FEBRUARY 15-23—National Class "A" Show of the Aeronautical Chamber of Commerce, St. Louis.
FEBRUARY 20-22—Second Annual Aviators' Reunion, Aviation Post, American Legion, Chicago.
MARCH 6-15—Second Annual Pittsburgh Aircraft Show.
APRIL 5-13—Third All-American Aircraft Show, Detroit.
APRIL 8-9—S. A. E. Meeting, Detroit.
MAY 3-10—New York Aircraft Show, Madison Square Garden, New York.
JULY 6—International Transportation Exposition Opens in Poland.
SEPT. 1-6—Fifth International Air Congress, The Hague, Holland.
NOV. 27-14—Aeronautical Salon, Paris, France.